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Literature references in [ ] refer to the *Review of Applied Mycology*.
Map references are to the C.M.I. distribution maps of plant diseases.

GOURMEL (MARGUERITE), BAUTE (R.), BELLOCQ (L.), & CANELLAS (J.). **Sur les rapports de la teneur en pollens et en champignons de l'atmosphère paloise avec les conditions météorologiques locales.** [On the relations between the contents of pollens and of fungi in the atmosphere of Pau and the local meteorological conditions.]—*C. R. Acad. Sci., Paris*, 244, 12, pp. 1682–1684, 1957.

In general, the maximum numbers of [unspecified] moulds were collected at the Centre of Climatological Studies, Pau, France, during the operation of the cold maritime polar and maritime Arctic systems, introduced by an easterly or especially a north-easterly wind and resulting in overcast, rainy weather, accompanied by high humidity, little sunshine, low temperature and precipitation either on the eve or on the actual day of collection. On the other hand, heavy pollen yields are associated with the mild or warm weather, abundant sunshine, low humidity, and high temperature developing under the influence of south to south-easterly winds of the tropical continental or tropical maritime systems.

The occasional coincidence of maximum yields of both pollens and moulds is tentatively attributed to an abrupt change of meteorological system, e.g., from tropical maritime to cold maritime polar.

VLODAVETS (V. V.). Применение розолового агара для микологических исследований. [The use of rosolic agar for mycological studies.]—Бот. Журн. [*J. Bot. U.S.S.R. = Bot. Zh. S.S.S.R.*], 41, 4, pp. 537–539, 1956.

At the Institute of General and Communal Hygiene, U.S.S.R. Academy of Medical Sciences, Moscow, rosolic agar was tested for suitability as a nutrient medium for mould fungi from the air [36, p. 484]. Parallel studies were carried out with must, meat peptone, and sucrose agars. Rosolic agar consisted of 100 gm. liquefied meat peptone agar with 5 gm. bile, 1 gm. lactose, and 0·2 ml. of a freshly prepared 5 per cent. alcoholic solution of rosolic acid. Rosolic agar was quite satisfactory for fungal growth, more colonies developing on rosolic plates than on must agar, the ratio being 125·5 as against 100 per cent. Species of *Alternaria*, *Cladosporium*, and *Aspergillus* grew well, 85·5, 19·6, and 13·3 per cent. more colonies, respectively, developing than on must agar; the figures for *Penicillium* were 12·3 per cent. lower.

On rosolic agar the colonies are smaller, fruiting is good, and bacterial colonies are not antagonistic to the fungi.

GAUTHERET (R. J.). **The nutrition of plant tissue cultures.**—*Annu. Rev. Pl. Physiol.*, 6, pp. 433–484, 1955. [Received 1957.]

In this general review of the information (306 references) at present available on the nutrition of plant tissue cultures, the chief sections deal with mineral

nutrition, carbon nutrition, growth stimulants, variations in growth factor requirements, growth inhibitors, the effect of growth regulators on the metabolism of plant tissue cultures, and liquid and solid media. There are a number of references to pathogenic fungi, viruses, and bacteria. Investigations by a number of workers are now being directed, with promising results, towards the analysis of cellular metabolism.

GOIDÀNICH (G.), CANOVA (A.), & MACCAFERRI (E.). **La cella termo-igrostatica dell'Istituto di Patologia Vegetale di Bologna.** [The thermohygrostat at the Institute of Plant Pathology, Bologna.]—Reprinted from *R. C. Accad. Sci., Bologna, 1956*, Ser. XI, 3, 7 pp., 1 pl., 2 figs., 1956.

A specially constructed, movable cabinet in use at the Institute of Plant Pathology, Bologna, Italy, for the study of plants in determined environmental conditions consists of a wooden cabinet, measuring 2 m. wide by 1·95 m. tall by 0·95 m. deep at the deepest part, with a sloping glass front in the top part where the plants are enclosed. The lower section contains the electrical apparatus for controlling the air, moisture, and heat. The temperatures obtainable range from 5° to 50° C. and the humidities from 10 to 99 per cent. Air circulation is 3 cu. m. per min. at first, but can be reduced as desired. Artificial illumination, if required, is given by fluorescent tubes.

KRASSILNIKOFF [KRASIL'NIKOV] (N. A.). **La classification des actinomycètes producteurs d'antibiotiques.** [The classification of the antibiotic-producing actinomycetes.]—*Ann. Inst. Pasteur*, 92, 5, pp. 597–604, 1957. [English summary.]

In general, all the strains comprising a given actinomycete species produce an antibiotic [cf. **32**, p. 636; **33**, p. 501] inhibiting the growth of all those of a rival species. Such antagonism may be either uni- or bilateral. Several examples are cited to illustrate this phenomenon. The new system for the classification of these organisms is based on the narrow specificity of their antibiotic products. On the foundation of crossed antagonism experiments the author has demonstrated the heterogeneity of many species hitherto regarded as homogeneous.

MACH (F.). **Untersuchungen über die Möglichkeiten einer Bekämpfung phytopathogener Pilze mit einer saprophytischen Bodenphase (Vermehrungspilze) durch Superinfektion mit antagonistisch aktiven Streptomyces-Stämmen.** [Studies on the possibilities of a control of phytopathogenic fungi with a saprophytic soil phase (fissiparous fungi) through superinfection with antagonistically active *Streptomyces* strains.]—*Zbl. Bakt.*, Abt. 2, 110, 1–5, pp. 1–25, 2 pl., 10 graphs, 1956.

At the Botanical Institute of the Ernst Moritz Arndt University, Greifswald, Germany, 97 per cent. of the fungi isolated from root-diseased plants of *Lepidium sativum*, winter and summer rape, red clover, lucerne, peas, yellow lupin, sugar beet, and tomato were shown by inoculation experiments on the first-named species to be pathogenic in varying degrees. Of 19 strains subjected to more intensive studies, 16 were referred to *Pythium debaryanum* and three to *Rhizoctonia* [*Corticium*] *solani*.

Of 1,058 strains of *Streptomyces* isolated from 66 soil samples, 87 per cent., mostly of the yellow-pigmented group [**32**, p. 590], proved to be fungistatic to the above-mentioned pathogens, especially *C. solani*. The active antagonists originated for the most part in fertile soils with a high humus content. Treatment of the soil with spores or mycelium of active *S.* strains did not appear to injure the plants in pot tests. The incidence of infection could not be reduced by simultaneous inoculation of the soil with the two pathogens and active streptomycetes on soy-bean hay,

but the use of washed spores or mycelium was more effective. When the antagonists were applied to the soil eight days earlier than the pathogens, the number of normal plants was increased from 10 per cent. in the inoculated control plots to between 50 and 80. Supplements of soy-bean flour raised the percentage of normal plants in the super-infected series. The culture filtrates of the active antagonists conferred no protection against the root-rotting fungi, nor were all the strains that inhibited the latter *in vitro* equally successful in the greenhouse. A single treatment of the soil with active antagonists prevented root rot development for a period of 12 weeks, after which the most powerful of the streptomycetes, strain No. 1047 (*S. aureus*), could still be isolated from soil and sand.

Borisova (Mme N. A.). Микотрофность древесных и кустарниковых пород Урдинских песков. [Mycotrophism of tree and shrub species of Urda sands.]—Бот. Журн. [*J. Bot. U.S.S.R.* = *Bot. Zh. S.S.S.R.*], 41, 6, pp. 876–880, 2 figs., 1956.

A survey carried out in 1952 by the Forest Institute, U.S.S.R. Academy of Sciences, showed that the Urda sands in the Western Kazakh region are extremely deficient in minerals and poor in organic matter. Mycorrhizal associations [cf. 34, p. 312] were found with spruce, poplar, oak, oleaster [*Eleagnus angustifolia*], birch, alder, and Caspian willow [*Salix* sp.].

Strelkova (Mme O. S.). Микоризы растений тундры и лесотундры на Таймыре. [Mycorrhiza of tundra and forest-tundra plants at Taymyr.]—Бот. Журн. [*J. Bot. U.S.S.R.* = *Bot. Zh. S.S.S.R.*], 41, 8, pp. 1161–1168, 9 figs., 1956.

Of the 104 grass and shrub species collected on Taymyr peninsula, U.S.S.R., and examined at the Leningrad Teachers' Training College, 30 possessed a mycorrhiza, mostly endotrophic with only a few of the ecto-endotrophic type [see preceding abstract]. The absence of typical ectotrophic mycorrhiza may have been due to the fact that no trees were examined, or that the samples did not represent the entire growth period, or that plants in the arctic generally do not develop peripheral hyphal sheaths.

Lewis (R. W.). **Amino acid nutrition of Alternaria solani.**—*Phytopathology*, 47, 3, pp. 121–125, 1957.

In further studies at Michigan State College, East Lansing, the influence of amino acids on the nutrition of *Alternaria solani* [32, p. 594] was investigated. It was found that the inhibitory effect of cystine and β-alanine was increased in the absence of vitamins, but lessened in the presence of other amino acids, notably proline, with high concentrations of which β-alanine increased growth. The effects of the amino acids, singly or in pairs, varied from enhancement to inhibition of growth and are tabulated, the results being very varied. The majority, however, either singly or in combination did not inhibit growth, a result contrary to the author's balance hypothesis of parasitism (*Amer. Nat.*, 87, pp. 273–281, 1953), which attempts to explain host specificity in terms of the effect of the host's diffusable metabolites on the parasite.

Sakai (R.). **Physiological studies of the Phytophthora infestans (Mont.) de Bary. Part 1. Carbon sources of Phytophthora infestans. Part 3. On the relation between the growth and the respiration of Phytophthora infestans in various nutrient solutions. Part 4. The effect of certain heavy metal elements upon the mycelial development of Phytophthora infestans in the nutrient solution.**—*Res. Bull. Hokkaido agric. Exp. Sta.* 68, pp. 63–66, 2 graphs, 1955; 70, pp. 99–105, 1 fig., 9 graphs, 1956; 71, pp. 51–55, 1 fig., 1956. [Japanese, with English summaries. Received April, 1957.]

A study of a large number of carbon sources for *Phytophthora infestans* [33, p.

375 and next abstract], using synthetic culture solutions containing vitamin B_1, showed that pH was not of great importance, but that 5 to 5·5 was probably optimum. Glucose, sucrose, galactose, maltose, lactose, inulin, glycerin, mannitol, succinic acid, and malic acid were all utilized by the fungus, particularly the first two.

Potato decoction favoured the growth of aerial and Waksman's solution of submerged mycelium. Glucose and glycerin proved the main sources of energy, oxygen consumption being at a maximum at pH 5 in 4 per cent. glucose in potato decoction and at 2 per cent. glucose in Waksman's medium. The respiratory quotient of the fungus is around 1 in the former medium and 0·5 in the latter, approaching 1 as the sugar content increases. The respiration of the fungus appears to be largely dependent on the cytochrome oxidase system.

In a standard nutrient solution containing mineral salts plus glucose and thiamine at 19° C. for 25 to 40 days iron (1 in 60,000 *M.* ferric chloride) and molybdenum (1 in 100,000 *M.*) stimulated mycelial development, but not sporulation. Zinc and manganese sulphate (both at 1 in 60,000 *M.*) had the opposite effect.

SAKAI (R.). **Physiological studies on the Phytophthora infestans (Mont.) de Bary. Part 2. Nitrogen source of Phytophthora infestans (Mont.) de Bary.**—*Ann. phytopath. Soc. Japan*, 19, 3–4, pp. 141–145, 2 figs., 1955. [Japanese, with English summary.]

Phytophthora infestans [see preceding abstract] was grown in culture solutions containing thiamine hydrochloride, the optimum concentration of which was found to be approximately 1 γ in 10 ml. Nitrate was a good nitrogen source but not the ammonium salt, which lowers the pH too much; nitrite nitrogen is not assimilated. Asparagine, L-aspartic acid, L-glutamic acid, and L-arginine monohydrochloride were better sources than nitrate, but glutamine, L-phenyl alanine, and L-proline were inferior.

TOMIYAMA (K.). **Cytological studies of resistance of Potato plants to Phytophthora infestans. I. The processes of alteration in the host cell produced by invasion of parasite.**—*Res. Bull. Hokkaido agric. Exp. Sta.* 67, pp. 28–38, 7 figs., 1954. [Japanese, with English summary. Received April, 1957.]

In this study epidermis was stripped from the midribs of young potato leaves inoculated with *Phytophthora infestans* [cf. 36, p. 493] and placed in hanging drops. In both susceptible and resistant varieties the nucleus of a cell being attacked migrates towards the invading hypha, and those of the surrounding cells towards the infected one. Initial penetration causes thickening of the cytoplasm, the appearance of protoplasmic strands, and protoplasmic streaming round the point entered. Even in the highly resistant variety 41089–8 [see next abstract] nothing else occurs until the appressoria have discharged into the cell and hyphal formation has begun, when rod shaped or spherical granules in Brownian movement, increasing in size and number, appear around the hyphae. Then the semi-lunar-shaped nucleus (on the cell wall) shrinks, rounds off, and becomes detached and though Brownian movement is still active, staining with neutral red and plasmolysis show that death of the cell occurs at this point. Some two hours after penetration the nucleus and cell contents turn yellow and Brownian movement ceases; in the ensuing 20 hours the cell contents turn brown, and finally black.

In the less resistant variety Kennebec the same process was noted in 66 per cent. of the infected cells, while in 31 per cent. degeneration was slower and no marked injury was apparent, even when neighbouring cells, not parasitized, were discoloured. In the susceptible variety Norin No. 1 the cell walls of infected and neighbouring cells may turn brown while there is still no discoloration of the cell contents.

Tomiyama (K.), Takase (N.), Sakai (R.), & Takakuwa (M.). **Physiological studies on the defence reaction of Potato plant to the infection of Phytophthora infestans. I. Changes in the physiology of Potato tuber induced by the infection of P. infestans and their varietal differences.**—*Res. Bull. Hokkaido agric. Exp. Sta.* 71, pp. 32–50, 14 graphs, 1956. [Japanese, with English summary. Received April, 1957.]

In this first paper of this series [cf. 35, p. 842] the reaction of potato tissue to *Phytophthora infestans* [see preceding abstract] was studied in the susceptible varieties Irish Cobbler and Norin No. 1 and the resistant varieties 41089–8, 4702–7, and Kennebec. At increasing periods after the inoculation of cut tuber surfaces with concentrated zoospore suspensions cylinders of tissue (22 mm. across) were removed, microtomed into 0·45 mm. thick slices, washed in running water for two to four hours, and then subjected to various tests. Attack by the pathogen caused increased respiration in the resistant varieties followed by increases in water-soluble protein, starch, and polyphenol, phenomena not occurring in the susceptible ones. The increase in water-soluble protein and starch is not attributable to loss of water, nor the former to the presence of hyphae. The increase in polyphenol compounds may be correlated with accelerated respiration. After 24 hours the polyphenol compounds and water-soluble proteins rapidly decreased in the resistant varieties and insoluble nitrogen compounds increased.

These observations indicate that infection causes a synthetic reaction, accompanying injury, in the tissue of resistant varieties. There is, however, no correlation between resistance and the conditions investigated in cut and uninoculated tubers compared with similar uncut tubers. Therefore some other explanation of the defence reaction must be sought.

Gallegly (M. E.) & Galindo (J.). **The sexual stage of Phytophthora infestans in Mexico.**—Abs. in *Phytopathology*, 47, 1, p. 13, 1957.

Abundant production of oospores obtained [in West Virginia] when isolates of *Phytophthora infestans* [see next abstract] from Mexico and the United States were paired [cf. 28, p. 245] prompted further study in Mexico, where antheridia of United States isolate 256 were observed to unite with oogonia of Mexican isolate 43 on water agar. Of 91 Mexican isolates paired on V-8 juice agar with both these isolates, 57 per cent. mated with 43 and 43 per cent. with 256. Eighteen United States and Canadian isolates maintained in Mexico mated only with 43. Oospores were found on Katahdin leaves at Toluca. Oospores are believed to contribute to the origin of physiologic races and survival of *P. infestans* in Mexico.

Smoot (J. J.), Gough (F. J.), & Gallegly (M. E.). **Oospore formation in Phytophthora infestans.**—Abs. in *Phytopathology*, 47, 1, p. 33, 1957.

Abundant oospore formation occurred [at West Virginia University] when each of three Mexican isolates of *Phytophthora infestans* [see preceding abstract] was paired with any of over 100 isolates from the British Isles, Western Europe, Africa, and North America. Mating reaction was not correlated with physiologic race. Oospores were formed also in the leaves of 16 potato varieties and one of tomato following paired inoculations with strains to which they were susceptible. Mature oospores varied from 24 to 56 μ diameter and from pale yellow to dark brown, depending on the medium.

Van der Plank (J. E.). **A note on three sorts of resistance to late blight.**—*Amer. Potato J.*, 34, 3, pp. 72–74, 1957.

The author considers that resistance in the potato to the known races of blight (*Phytophthora infestans*) [33, p. 251; 35, p. 318] may disappear if varieties with this

type of resistance are widely planted [36, p. 346], since they will cause an increase of new races. This racial resistance has scarcely been put to the test yet, because the most widely planted varieties in many potato-growing countries are without this type of resistance.

Field resistance is associated with late maturity and appears to be reasonably stable, but no method of transferring it to the susceptible early varieties has yet been found.

The third type of resistance is that which is evident in varieties without racial resistance and of similar maturity, e.g., Sebago and Green Mountain.

It is postulated that the genes R_1, R_2, R_3, and R_4 may confer resistance other than racial and that an untapped differential resistance may exist in wild species such as *Solanum demissum*. These possibilities should be explored in the hope of breeding a popular early-maturing variety with stable resistance.

HAWKES (J. G.). **Potato breeding in Russia—July, 1956.**—*Euphytica*, 6, 1, pp. 38–44, 5 figs., 1957. [Dutch summary.]

On a visit to potato research institutes in the U.S.S.R. the author noted, *inter alia*, that in breeding for resistance to potato blight (*Phytophthora* [*infestans*: 34, p. 477; 35, p. 921; cf. preceding abstract]) at the Institute of Plant Industry, Leningrad, crosses between *Solanum demissum* and *S. tuberosum* are chiefly used. All varieties are tested against a mixture of biotypes of the fungus, no isolation of individual races being attempted. The following resistant varieties are on the market: Kameraz No. 1 [32, p. 395], Krasnoufimsky, Vralsky [loc. cit.], Detskosel'sky [33, p. 624], Pushkinsky, Dyelskovsky, and Uktussky. Pushkinsky [loc. cit.] is derived from a cross involving a spontaneous hexaploid clone of *S. vallis-mexici*. Volkhovsky, obtained from the F_2 of *S. demissum*×*S. tuberosum* ssp. *andigena* crossed with *S. tuberosum*, is a promising line.

At the Moscow Potato Institute the pentaploid hybrid *S. semidemissum* is chiefly used. The resistant varieties Phytophthora-Ustoychevy (resistant) and Moskovsky were issued there in 1935.

There is virtually no breeding for resistance to viruses, and there is no certification scheme. The considerable collections of wild potatoes from the Americas had not, until recently, been grown in insect-proof houses and are extensively infected by viruses.

PAPADOPOULLOS (C.). **Control of late Potato blight.**—*Countryman, Nicosia, 1957* [3], pp. 18–19, 1957.

In spraying experiments carried out by the Plant Protection Service, Department of Agriculture, Cyprus, potato blight (*Phytophthora infestans*) [36, p. 381] was successfully controlled at Phrenaros by four applications at 12- to 15-day intervals of a commercial preparation containing 65 per cent. zineb wettable powder, at Avgorou by two or three of captan (50 per cent. wettable) followed by two of copper oxychloride or one of zineb, and at Xylophaghou by three of either Bordeaux mixture or copper oxychloride. The resulting yield increases far outweighed the cost of spraying.

BOURKE (P. M. A.). **Weather and Potato blight in Chile.**—*WMO Bull., 1957*, [1], pp. 36–38, 1957.

Commenting on a recent visit to Chile to advise on meteorological forecasting for agriculture, with special reference to potato blight (*Phytophthora infestans*), the writer notes that a season so favourable to the disease as 1951 [31, p. 572] is likely to recur about once in eight years. Imported varieties resistant to blight are contrary to local taste. Irish criteria for forecasting blight weather [34, p. 540] proved equally applicable in Chile.

WATSON (MARION A.). **The effect of different host plants of Potato virus C in determining its transmission by aphids.**—*Ann. appl. Biol.*, 44, 4, pp. 599–607, 1956.

A comparative study was made at Rothamsted Experimental Station of two stocks of potato virus C [cf. 27, p. 332; 34, p. 475]. One, C^n, obtained in 1945 from Edgecote Purple potatoes and at that time not aphid transmissible [23, p. 404], even when over 2,000 vectors were used in conditions optimal for the transmission of the serologically related potato virus Y, has been maintained subsequently by manual inoculation of *Nicotiana glutinosa* and tobacco. In 1955 it proved transmissible to some extent by *Myzus periscae*, 1 in 20 aphids transmitting it compared with 1 in 2 for virus Y. At the same time another stock, C^p, derived from Edgecote Purple potatoes in 1955, proved still non-transmissible by aphids. Both stocks when inoculated to Majestic potato leaves and tobacco produced only local lesions.

When inoculated to Majestic and returned to tobacco, C^n generally lost its aphid transmissibility, which was not recovered in subcultures. Transmission by aphids did not isolate a strain more readily transmitted by aphids, in fact, for two or three subcultures transfer was more readily obtained from manually inoculated plants. Of three out of 14 isolates remaining aphid transmissible on return to tobacco after a second passage through potato, one proved thereafter rather more easily aphid transmissible even after further passage through potato.

The results suggest that the aphid transmissibility of a virus is determined to some extent by the host in which it multiplies, virus C having apparently mutated while infecting *N. glutinosa*, the reverse mutation generally occurring in potato. Whatever the mechanism of the change, transmissibility by aphids would appear to be genetically determined and linked with other inherent properties.

WOLCOTT (A. R.) & ELLIS (N. K.). **Associated forms of internal browning of Potato tubers in northern Indiana.**—*Amer. Potato J.*, 33, 12, pp. 343–352, 7 figs., 1956.

Incidence of internal browning of potatoes has been increasing on muck and sandy soils in northern Indiana [36, p. 421]. Symptoms of the following four types of browning have been observed: internal brown spot [loc. cit.; 34, p. 746], heart necrosis [cf. 35, p. 227], corky ring spot or sprain [spraing: 34, p. 581], and canker type internal rust spot [cf. 35, p. 710], the last being less common and not reported hitherto in the United States.

SÜSS (A.). **Über die Aufnahme und Verteilung von Schwefel bei gesunden und viruskranken Pflanzen gezeigt an Hand von radioaktivem Schwefel.** [On the uptake and distribution of sulphur in healthy and virus-diseased plants demonstrated by means of radio-active sulphur.]—*Prakt. Bl. PflBau.*, 51, 5, pp. 181–185, 4 figs., 1956.

Eye cuttings from tubers of the potato variety Ackersegen, both healthy and virus-infected, were allowed to attain a shoot length of 10 cm. and then transferred to a nutrient solution containing sodium sulphate with radio-active sulphur. In healthy leaves the sulphur was uniformly distributed, but in those infected by potato leaf roll virus it accumulated in the veins, though uptake was less than in the healthy. With [unspecified] mosaic virus it tended to accumulate at the edges of the leaves.

In tobacco plants infected by [? tobacco] mosaic virus and [potato] virus X, investigated in the same way, the uptake of the element was also reduced and it accumulated in the veins.

BODE (O.). **Untersuchungen über den Lichtbedarf von Kartoffelaugenstecklingen.** [Studies on the light requirements of Potato eye cuttings.]—*NachrBl. dtsch. PflSchDienst (Braunschweig), Stuttgart*, 9, 4, pp. 56–60, 2 figs., 5 graphs, 1957.

In experiments here reported from the Institute for Agricultural Virus Research,

Brunswick, artificial light was found to normalize the growth of potato eye cuttings of seven varieties grown under glass under short-day winter conditions in North Germany and facilitate the diagnosis of virus infection in them. The tubers were sprouted by a method described by the author (ibid., 2, pp. 183–186, 1950).

Without supplementary light, infection by potato leaf roll virus was detected in only 56 per cent. of the plants, whereas with lighting from a high pressure mercury lamp (16 hrs daily) 93 to 98 per cent. were found, the figure for commercial tube lighting being 71 per cent. It is suggested that the mercury lamp was especially effective by virtue of its short waves. With streak [potato virus Y] and mosaic [? potato virus X] lighting did not increase the number of infections observed, but the greater chlorophyll content and broadness of the leaves facilitated the work.

STEINBAUER (C. E.). **Types of Sweetpotato cuttings for most precise evaluation of Fusarium wilt susceptibility.**—*Proc. Amer. Soc. hort. Sci.*, 68, pp. 394–399, 1956.

In evaluating sweet potato selections at the Plant Industry Station, Beltsville, Maryland, for resistance to *Fusarium oxysporum* f. *batatas* [*F. bulbigenum* var. *batatas*: 35, p. 632] 6-in. cuttings of the highly susceptible Porto Rico and the tolerant-susceptible Triumph varieties were prepared from greenhouse-grown plants. Successive four-node cuttings were made from the main stem or branch tips downwards and then grouped according to their position of origin. When rooted, the ends were dipped in a composite spore-mycelium suspension of five strains of the fungus.

Two tests were made: one on cuttings taken on 30th June, 1955, when the longest shoots were four to eight weeks old, and inoculated on 11th July; the other on cuttings of known age from relatively young plants taken on 28th October and inoculated on 8th November, sets constituting different variety- and position-subsamples being used. Evaluations were made 10, 14, or 21 days after inoculation.

The results showed that the most sensitive evaluations of wilt susceptibility in the greenhouse can be obtained by using tip cutting plants. If sufficient tip cuttings are not available, good but somewhat less consistent results may be expected for varieties with growth-habits of the types used by using four-node cuttings taken up to about 14 to 16 nodes below the apex (approximately four weeks old) from plants making good vegetative growth. Composite samples of cuttings from young vines can give results as good as, or only slightly less consistent than, those secured when only the first three or four successive cuttings from the apex are used.

Hoja blanca. A threat to U. S. Rice.—*Rice J.*, 60, 2, pp. 14, 48, 1957.

The occurrence of a new rice disease, 'hoja blanca' (white leaf) in Cuba, Panama, and Venezuela constitutes a potential danger to the rice-growing areas of the United States. The disease first appeared in Cuba about two years ago and is widespread through all the rice provinces. Severity ranges from a trace to total losses in some fields. It spread to Venezuela at the end of 1956 and ran through the rice fields in three months, causing severe losses. In badly affected areas the crop was a total loss. Susceptible varieties included Bluebonnet 50, Century Patna 231, Toro, Nato, and Zenith in Venezuela, and Sunbonnet, Magnolia, and Rexoro in Cuba. An inferior variety grown in Cuba, Zayas Bazan, showed some resistance.

The cause of white leaf is not definitely known but is believed to be an insect-transmitted virus similar to that causing rice stripe in Japan. Symptoms include longitudinal pale yellow or white stripes on the leaves and an abnormally long flag leaf, the emerging heads from which are sterile and appear twisted and crescent-shaped.

All the rice varieties grown in the United States are susceptible and growers are on the alert for the possible spread northwards of the disease. Strict measures are called for.

CARTER (H. P.) & LOCKWOOD (J. L.). **Methods for estimating numbers of soil micro-organisms lytic to fungi.**—*Phytopathology*, 47, 3, pp. 151–154, 1957.

At Ohio Agricultural Experiment Station, Wooster, soil micro-organisms, chiefly streptomycetes, lytic to fungi [see next abstract] were assayed by spraying soil suspensions on to agar plates that had been seeded with conidia of the test fungus. Experimentation, described in detail, showed that the best results were obtained with *Glomerella cingulata*, the conidia being mixed with the agar. Optimum results were obtained with peptone agar at 10 or 15 ml. per plate and a soil suspension of 1 in 1,000 applied about seven days after seeding the plates, which were incubated at 26° C., the maximum number of lytic colonies appearing after some 18 days.

CARTER (H. P.) & LOCKWOOD (J. L.). **Lysis of fungi by soil microorganisms and fungicides including antibiotics.**—*Phytopathology*, 47, 3, pp. 154–158, 1 fig., 1957.

In further studies of the lysis of fungi [see preceding abstract] a photometric method was used to determine changes in density of mycelium, using a microscope and an electrophotometer. Comparison was made of the lytic action of certain streptomycetes, of antibiotics, and of fungicides. The first showed the greatest lytic action, lysing both living and dead mycelium (killed by chloroform or by autoclaving) in peptone agar, whereas the others lysed only living mycelium.

PIRSON (A.). **Functional aspects in mineral nutrition of green plants.**—*Annu. Rev. Pl. Physiol.*, 6, pp. 71–114, 1955. [Received 1957.]

The author reviews and discusses, with 310 references to the literature, the present state of knowledge concerning the mineral nutrition of green plants, the main emphasis being on functional-dynamic aspects, which offer hope for future progress in a causal analysis of mineral effects. General considerations on the essentiality of elements and on algae as test organisms in research on plant nutrition are followed by sections on the individual elements in turn.

GEERING (J.). **Urgesteinsmehl und Spurenelemente.** [Ground rock and trace elements.]—*Mitt. schweiz. Landw.*, 5, 3, pp. 49–59, 5 figs., 6 graphs, 1957.

The author condemns the use of the various ground rock preparations which have achieved a certain popularity among Swiss farmers on account of their supposed 'natural' invigorating effects on exhausted soils and also for their supposed high content of trace elements. He reports pot experiments in which oats growing in manganese-deficient soil and spinach and rape in boron-deficient soil responded to treatment with the elements in question but made little or no improvement with commercial ground rock preparations.

HUDSON (J. R.). **Heavy metal content of Hop plants in relation to nettlehead.**—*J. Inst. Brew.*, N.S., 62, 5, pp. 419–424, 1956.

At the Brewing Industry Research Foundation, Nutfield, Surrey, analyses during the 1955 season of samples of soil, leaves, and cones from hop plants infected by nettlehead virus [35, p. 875] and of similar material from healthy hills in the same garden showed that the former contained appreciably larger quantities of nickel than the latter. A wider survey of cone samples from eight other gardens suggested that the finding was general.

GORDON (W. L.). **The occurrence of Fusarium species in Canada. V. Taxonomy and geographic distribution of Fusarium species in soil.**—*Canad. J. Bot.*, 34, 6, pp. 833–846, 1956.

In continuation of these studies at the Plant Pathology Laboratory, Winnipeg [cf. 34, p. 258; 36, p. 501], 206 soil samples were examined, mostly from

Manitoba, but some from seven other Canadian provinces. *Fusarium* accounted for about five per cent. of the 25,973 fungus colonies obtained and 90 per cent. of these were of *F. oxysporum* (contributing 67 per cent., 53 per cent. being its var. *redolens*), *F. equiseti*, and *F. solani*. Other species isolated were *F. merismoides*, the only one not also seed-borne by cereals or associated with their root rots, *F. poae* (eight isolates only), *F. sporotrichioides* (two), *F. avenaceum* (one), *F. semitectum* (two), *F. acuminatum* (40), *F. culmorum* (four), *F. sambucinum* (58) and its var. *coeruleum* (14), and *F. moniliforme* [*Gibberella fujikuroi*] (two). The apparent absence of *F. graminearum* and *F. nivale* [*Calonectria nivalis*] is noteworthy.

Dominik (T.). **Huby.** [Fungi.]—160 pp., 107 figs., State Institutions Educational Publishers, Warsaw, 1957. Zł 8.10.

This booklet on the Polyporaceae, in itself a contribution to the fungal flora of the Kuźna Nieborowsky forests in Poland, includes brief descriptions of the role of fungi in nature, their economic significance, use in medicine, physiology, morphology, and systematics. Keys for the determination of families, sub-families, and species according to Pilát (Atlas des champignons de l'Europe. Prague, 1939) and of families and genera commonly accepted in literature popularizing the knowledge of fungi are given as well as indexes of Latin and Polish names and synonyms. There is a bibliography of 21 titles.

Kovachevsky (I.). Новые для Болгарии паразитные грибы. [Parasitic fungi new for Bulgaria.]—Изв. бот. Инст. Българ. А Н [*Bull. Inst. bot., Sofia*], 4, pp. 301–312, 1955. [Abs. in *Referat. Zh. Biol.* 3, p. 192, 1957.]

New hosts are reported for 18 species of fungi in Bulgaria.

Mentieva (Mme N.A.). Грибные болезни культурных растении, обнаруженные в Куба-Хачмасском массиве Азербайджанской ССР. [Fungus diseases of cultivated crops observed in the Kuba-Hachmassk massif of the Azerbaijan S.S.R.].—Докл. Акад. Наук Азерб. ССР. [*Proc. Acad. Sci. Azerb. S.S.R.*] 12, 3, pp. 217–224, 1956. [Abs. in *Referat. Zh. Biol.* 3, p. 192, 1957.]

From 1952 to 1954, 80 fungus diseases were found on 34 crop species in Azerbaijan, U.S.S.R. The most harmful were yellow rust [*Puccinia glumarum*: 35, p. 437] and powdery mildew [*Erysiphe graminis*: 34, p. 471] of cereals, powdery mildew of cucumber [*E. cichoracearum*: 34, p. 206], scab [*Venturia inaequalis*: 35, p. 907] and leaf spot [*Physalospora obtusa*: 34, p. 158] of apple, leaf fleck [*Mycosphaerella sentina*: map 325] of pear, and brown rot of apple and pear [*Sclerotinia fructigena*] and stone fruits [*S. fructigena* and *S. laxa*].

Khabiri (E.). **Contribution à la mycoflore de l'Iran. Deuxième liste.** [A contribution to the mycoflora of Iran. Second list.]—*Rev. Mycol., Paris*, 21, 2–3, pp. 174–176, 1956.

This further list of parasitic fungi from Persia [33, p. 262] includes *Leveillula taurica* [map 217] on *Elaeagnus angustifolia*, *Foeniculum piperitum*, and *Glycyrrhiza asperrima*; *Oidium tabaci* [*Erysiphe cichoracearum*: cf. 30, p. 473] on tobacco; *Ustilago crameri* [cf. 28, p. 378] on *Setaria viridis*; *U. cruenta* on *Sorghum bicolor*; *U. cynodontis* on *Cynodon dactylon*; *U. hordei* [loc. cit.] on *Hordeum murinum* and *H. leporinum*; *Puccinia pruni-spinosae* [loc. cit.] on *Cerasus* [*Prunus*] *laurocerasus*; *Gymnosporangium confusum* [cf. 26, p. 131] on *Cotoneaster nummularia* [*C. racemiflora*]; and *G. juniperinum* on *Sorbus aucuparia* [cf. 34, p. 752].

Greene (H. C.). **Notes on Wisconsin parasitic fungi. XXI.**—*Trans. Wis. Acad. Sci. Arts Lett.*, 44 (*1955*), pp. 29–43, 1956.

This annotated report on parasitic fungi collected in Wisconsin in 1954 [cf. 34,

p. 322] includes 40 new host and 17 new fungus records for the State. Four new species are described.

Cummins (G. B.) & Stevenson (J. A.). **A check list of North American rust fungi (Uredinales).**—*Plant Dis. Reptr, Suppl.* 240, 193 pp., 1956.

In accordance with Article 69 of the International Code of Botanical Nomenclature (1952) [cf. 35, p. 88], which states that the perfect state is that which consists of spores giving rise to basidia in the Uredinales, thus excluding *Uredo* names from any consideration in selecting the valid perfect name, the authors present an alphabetical list of the North American rust names, hitherto based on *Uredo* or other imperfect state names, in conformity with the Code [cf. 35, p. 791]. Distribution and hosts are given for species not covered in the 'North American Flora' or Cummins's 'Manual'.

New records for North America other than Canada or the United States include *Angiopsora zeae* on maize in the Dominican Republic, Grenada, Guatemala, Jamaica [35, p. 722], Mexico, Puerto Rico, and St. Vincent; *Aecidium cantense* on potato in Honduras; *Puccinia paulensis* on chilli (*Capsicum annuum*) in Guatemala; and *Uredo scabies* on *Vanilla* spp. intercepted from Mexico, Nicaragua, and Panama.

Guyot (L.), Malençon (G.), & Massenot (M.). **Contribution à l'étude des Ustilaginales parasites du basin méditerranéen occidental. (Afrique du Nord et Péninsule ibérique).** [A contribution to the study of the parasitic Ustilaginales of the western Mediterranean basin. (North Africa and the Iberian Peninsula).] —*Rev. Path. vég.*, 34, 4, pp. 181–216, 5 pl., 1955. [Received 1956.]

Descriptive notes are given on some smuts from the western Mediterranean, with diagnoses of four new species. The following are included: *Tolyposporium globuligerum* in ovaries of *Leersia hexandra* from French Morocco, *Tuburcinia* [*Urocystis*] *magica* on leaves of *Allium* sp. from Tunisia, *Ustilago avenae* on spikelets of *Avena sterilis* in Morocco, *U. crus-galli* on *Panicum crus-galli* var. *colonum* in Morocco, and *U. cynodontis* in inflorescences of *Cynodon dactylon* in Morocco and Spain.

Cunningham (G. H.). **Thelephoraceae of New Zealand. Part IX. The genus Stereum. Part X. The genera Cytidia and Aleurocystis. Part XI. The genus Aleurodiscus.**—*Trans. roy. Soc. N.Z.*, 84, 2, pp. 201–268, 8 pl., 17 figs., 1956. [Received May, 1957.]

In these further studies of the series [cf. 36, p. 130] detailed descriptions and a key are given of the 15 New Zealand species of *Stereum*, of which two, *S. actearoa* and *S. scutellatum*, are new. Excluded are 31 species previously reported as present in the country. Among species of economic importance are listed *S. sanguinolentum* on *Pinus radiata* [13, p. 341] and *Pseudotsuga taxifolia*, probably introduced on its exotic hosts since it does not occur on native trees; *S. illudens* [cf. 16, p. 221] on decorticated trunks such as power poles; and the silver-leaf organism, *S. purpureum* [26, p. 303; 30, p. 362], which is common on all kinds of cultivated fruits and has also been collected twice on *Nothofagus cliffortioides* and once on *Pittosporum tenuifolium*.

The genera *Cytidia* and *Aleurocystis* are each represented by a single species in the Dominion.

In the last part a diagnostic key and descriptions of the 17 New Zealand representatives of *Aleurodiscus* are provided, of which six are new species.

Schneider (R[oswitha]). **Penicillium taxi nov. spec., eine neue sklerotienbildende Art auf Nadelstreu von Taxus baccata.** [*Penicillium taxi* n.sp., a new

sclerotium-forming species on needle litter of *Taxus baccata*.]—*Zbl. Bakt.*, Abt. 2, 110, 1–5, pp. 43–49, 9 figs., 1956.

During May and June, 1952, a copious needle-shedding from yew trees occurred at the Biological Institute, Berlin-Dahlem. The needles had pale yellow, ill-defined spots, and on both sides of the midrib on the lower surface were punctiform, brown necroses which coalesced and expanded into weals. No sign of a fungus could be detected at the time, but during the following months, noticeably hard, dark grey, nearly black sclerotioid, bodies developed on fallen needles, which were kept over the winter, some in the open and others in a refrigerator at 8° C. By March, 1953, they were covered with the grey-green conidiophores of an exceptionally large-spored *Penicillium*, which is regarded as a new species, *P. taxi*. The spores are 4·3 to 12·5 by 2·8 to 7 (mean 7·8 by 4·1) μ, and the sclerotia 300 to 600 μ in diameter. *P. taxi* was shown to be entirely unrelated to the outbreak of needle-fall, but it is thought to be concerned in the decomposition of the litter.

Webster (B. N.). **Report of the Mycologist for the year 1955.**—*Bull. Tea Res. Inst. Ceylon* 37, pp. 53–57, 1956.

This report [cf. 35, p. 238] includes the following items. The yield figures for the St. Coombs No. 8 field experiment [on the control of *Exobasidium vexans*: loc. cit.] were 1,030 lb. of made tea for Block A, 1,468 for B, and 1,377 for C. The control area (A) had been unsprayed since 1946. Results indicated that heavily manured bushes may be more resistant.

A field trial on the St. Coombs estate resulted in good protection against *E. vexans* by fytolan, a 50 per cent. copper fungicide produced by Imperial Chemical Industries. Coppesan, a similar preparation produced by Boots Pure Drug Co., compared favourably with other products. Shell copper naphthenate used at $\frac{1}{2}$ and 1 pint per acre in 12 gals. of water emulsified well with Shell emulsifier L but proved less effective than perenox, blitox, and Shell copper. Cobredon, a 45 per cent. metallic copper fungicide from Millers Ltd., gave good control at 6 oz. per acre, and Shell copper at 4 oz. per acre used with 2 oz. Tenac sticker was also effective. Bayer 4521 red copper proved unsatisfactory in its present formulation.

The BSE Junior power duster was found unsuitable, but the Kestrel hand and power dusters and the Platz express battery sprayer were highly effective.

Sarmah (K. C.). **Mycological section.**—*Rep. Tocklai exp. Sta., 1955*, pp. 92–110, [1956.]

In this report [cf. 35, p. 399] the author mentions *Derris robusta*, *Adanenthera pavonina*, and *Gliricidia maculata* as additional hosts of red 'rust' (*Cephaleuros parasiticus*) [*C. mycoidea*: 34, p. 66] of tea. Mercurized copper oxychloride sprays applied in the winter were ineffective for red 'rust' control.

Poria hypobrunnea [27, p. 260] was unusually destructive on tea in the Dooars district.

Perenox and coppesan (modified) were used in 0·25 per cent. suspension, with or without a spreading agent, against black rot [*Corticium theae* and *C. invisum*] of tea, two applications being made in May at an interval of 18 days. Results showed a reduction of the disease by about 50 per cent., even in late August when incidence is usually highest.

Trials were begun on the control of *Botryotinia theae* [cf. 30, p. 126] and *Ciboria theae* on tea flowers with fernide [thiram].

Sarmah (K. C.). **A note on the use of Stylosanthes guyanensis Sw. var. gracilis (H.B.K.) Vog. in relation to black rot disease of Tea.**—*Two & a Bud* (*News Lett. Tocklai exp. Sta.*) 3, 4, p. 21, 1956.

In Golaghat, Assam, in 1955, black rot (*Corticium invisum*) [see preceding

abstract] was observed on *Stylosanthes guyanensis*, which has recently been used in India as ground cover for young tea, and in 1956 *C. theae* [loc. cit.] was found to have spread from this cover crop to young tea plants.

Ruizhkov (V. L.). Метод метаболитов и антиметаболитов в изучении размножения вируса мозаичной болезни Табака (ВТМ). [Metabolite and antimetabolite method in the study of Tobacco mosaic virus (TMV) multiplication.]—Изв. Акад. Наук СССР. [*Bull. Acad. Sci. U.S.S.R.*], *1957*, 1, pp. 41–54, 1957.

The author reviews with frequent reference to the literature (37 titles) the work done since 1938 by himself and other authors on the multiplication of tobacco mosaic virus, particularly in connexion with metabolite and antimetabolite activities. Most of the information has already been noticed [35, p. 46 *et passim*].

Köhler (E.). **Studien über das Verhalten des Tabakmosaikvirus im geimpften Tabakblatt.** [Studies on the behaviour of the Tobacco mosaic virus in the inoculated Tobacco leaf.]—*Zbl. Bakt.*, Abt. 2, 110, 6–10, pp. 237–243, 3 graphs, 1957.

Using the new method of inoculation with a mixture of tobacco mosaic and potato virus X [36, p. 172], the author studied the changes in the concentration of the former in sap extracts of Samsun tobacco leaves. Inoculation was consistently followed by an initial decrease in activity. The earliest moment at which an increase commenced was between the 20th and 24th hour at a temperature of 23° C., the corresponding time at 20° and 20·5° being from the 28th to 34th and below 20° after the 36th hour. The decline is attributed to the inactivation of the virus on its application to the leaf and the increase to the renewed formation of active material.

Thresh (J. M.). **Some effects of tannic acid and of leaf extracts which contain tannins on the infectivity of Tobacco mosaic and the Tobacco necrosis viruses.**—*Ann. appl. Biol.*, 44, 4, pp. 608–618, 1956.

In investigations at Rothamsted Experimental Station the inhibition of infection by the tobacco necrosis and tobacco mosaic viruses by tannic acid and by extracts of raspberry and strawberry leaves was associated with the precipitation of the viruses. Precipitation and inhibition were reversible, and infective virus was obtained from the precipitate formed between the viruses and tannins. Infectivity was completely restored by diluting mixtures of virus and tannin and partially restored by adding alumina or nicotine sulphate. It would seem that viruses and tannins form non-infective complexes in which the virus and tannin components are held together by co-ordinate linkages or hydrogen bonds.

Maceration of tobacco leaves infected by tobacco mosaic virus with raspberry leaves greatly reduced the infectivity of the extracts. The addition of nicotine sulphate to the mixture of leaves before it was ground increased infectivity, though nicotine sulphate alone decreases the infectivity of tobacco mosaic virus. Even in the presence of nicotine sulphate much of the virus was precipitated by substances from the raspberry leaves.

Dilution of mixtures of tannin and virus increased infectivity and extracts of *Fragaria vesca* roots infected by a tobacco necrosis virus were more infective when prepared by macerating the roots with four times their weight of buffer at pH 8 than when made without buffer.

It is evident that viruses will be transmitted most readily from plants containing tannins by selecting tissues with a high virus content but a minimum amount of tannin. The ability of nicotine sulphate to facilitate the transmission from plants containing tannin, noted by Limasset [cf. 32, p. 470] and by Cadman [cf. 35, p. 618], will probably be turned to account in new techniques.

Rossouw (D. J.). **The control of powdery mildew in Tobacco.**—*Fmg. in S. Afr.*, 32, 11, pp. 27–28, 2 figs., 1957.

In experiments at the Central Tobacco Research Station, Rustenburg, South Africa, to determine the effect of temperature on powdery mildew (*Erysiphe cichoracearum*) of tobacco [35, p. 163], the disease developed most rapidly at 23·5° C., while no development occurred at 5° or 25°. Symptoms disappeared at 25° but not at 5°.

Karathane used for control was found to decompose rapidly and to have no detrimental effect on smoking quality.

Croxall (H. E.), Norman (Theresa M.), & Gwynne (D. C.). **Effect of 2:4:6-trichlorophenoxyacetic acid on the susceptibility of Tomato plants to Didymella lycopersici.**—*Plant Path.*, 6, 1, pp. 27–31, 1957.

In work of the National Advisory Service, Newcastle-upon-Tyne, conducted in 1952 to determine whether 2:4:6-trichlorophenoxyacetic acid (2,4,6-T) renders tomato plants more resistant to *Botrytis cinerea* [cf. 31, p. 249], greenhouse plants sprayed twice with this material wilted and were found to have basal lesions caused by *Didymella lycopersici*, which affected no other plants in the house at any time during the growing season. In a parallel experiment in another glasshouse (new, and supplied with soil that had never carried tomatoes), plants watered with 2,4,6-T also became infected by *D. lycopersici*.

Two years later, after the house used had been thoroughly washed down with formalin, plants grown in sterilized John Innes compost in new pots were treated on 3rd and 20th September with 1 pint per plant of 2,4,6-T at 500 and 250 p.p.m., applied to the soil, or sprayed with $\frac{1}{4}$ pint per plant at 250 p.p.m., the controls being treated with water only. All the plants were watered with a suspension of *D. lycopersici* spores one day after the first treatment. Only two of the 14 controls and none of the plants sprayed with the chemical became infected by *D. lycopersici*, but eight of 14 plants treated through the soil at 500 p.p.m. and one at 250 p.p.m. did.

As it was thought that the chemical might perhaps facilitate the entry of the fungus by injury, in similar experiments during 1955 the plant bases were surrounded with transparent plastic collars. In this trial (using 2,4,6-T at 500, 250, and 125 p.p.m.) only one of the five inoculated controls became infected, indicating some inherent degree of resistance which was reduced by all the treatments, including spraying plants, which showed that root injury by the chemical was not a major factor. In experiments during 1956, watering the plants with the chemical at strengths of 250 to 1 p.p.m. again increased infection, as compared with the controls, and infection by *Phytophthora* sp. was found in some plants given the chemical at 40 p.p.m. or higher, but not in the controls or in plants given lower dosages.

The evidence obtained strongly indicates that the application to tomato plants of 2,4,6-T at concentrations of 500 to 40 p.p.m. increases susceptibility to *D. lycopersici*, the close proximity of the spores of which to the bases of tomato stems does not necessarily cause infection. The chemical appears to break down the resistance of the plant by some process at present unknown [cf. 36, p. 42].

Besemer (A. F. H.). **Enige voorlopige gegevens over de bestrijding van Botrytis cinerea Fr. op Tomaat.** [Some preliminary data concerning the control of *Botrytis cinerea* Fr. on Tomato.]—Abs. in *Tijdschr. PlZiekt.*, 63, 1, p. 22, 1957.

Infection of tomatoes by *Botrytis cinerea* is stated to be greatly increasing in frequency in the Netherlands, where it is quite easily controllable on the fruits by spraying with any of the fungicides used against *Cladosporium fulvum*, e.g., maneb,

zineb, and rhodane dinitrobenzol, while TMTD [thiram] combined with zineb and the same compound in oil are also very effective. On the stems, however, the pathogen does not yield so readily, only thiram (0·4 per cent.) and the same in oil having given reasonably satisfactory results. It is best applied as a spray of relatively coarse (300 μ) particles (not as an aerosol, the usual method for the tomato crop), with a large amount of water (about 1,500 l. per ha.).

Cox (R. S.) & Hayslip (N. C.). **Notes on current development of gray mold, Botrytis cinerea Fr., of Tomato and its control.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 235–236, 2 graphs, 1957.

In experiments conducted during the 1955–6 season in Florida at the Everglades Experiment Station, Belle Glade, and the Indian River Field Laboratory, Fort Pierce, repeated applications of nabam plus any of a number of metallic salts increased the susceptibility of Manalucie tomato plants to *Botrytis cinerea* [cf. 35, p. 334]. The evidence obtained also indicated that zineb and maneb could produce the same effect if used extensively, and that the increased susceptibility induced was not confined to the Manalucie variety. Appreciable control was, however, given by vancide 51, tennam, thylate (thiram), and phygon. The last-named tended to nullify the adverse effect of nabam-zinc sulphate. Thylate, tennam, vancide 51, and fermate appeared to reduce fruit rot caused by *Botrytis* [cf. 32, p. 648] and *Rhizoctonia* [? *Corticium solani*: cf. 30, p. 504].

Bunikovskaya (Mme K. M.). Обзор грибных болезней деревьев и кустарников в дендропарке «Тростянец». [A survey of fungus diseases of trees and shrubs in the arboretum 'Trostyanets'.]—Бюлл. бот. Сада [*Bull. bot. Gdn, Moscow*], *1957*, 27, pp. 94–96, 1957.

A survey carried out in 1951 and 1952 in the 'Trostyanets' arboretum in the Chernigov region of the U.S.S.R. revealed the presence of at least 159 species of fungi causing diseases of trees and shrubs. They were all equally widely distributed in the different ecological parts of the arboretum. The most damage was caused by *Trametes pini* on pine and *Fomes fomentarius* and *F. igniarius* on verrucose birch [*Betula verrucosa*], *F. igniarius* also affecting horse-chestnuts, oaks, aspen, willows [*Salix*], *Gleditschia* sp., and grey walnut. Included among the other fungi recorded were *F. annosus* [6, p. 201] on spruce and Fraser fir [*Abies fraseri*]; *Gymnosporangium sabinae*, *G. juniperi*, *G. confusum*, and *G. clavariiforme* on conifers, particularly juniper, and on deciduous trees; *Marssonina juglandis* on black, Greek, and grey walnuts; *Lophodermium pinastri* on pine; and *Pestalotia funerea* on ? *Thuja*.

Sergeeva (Mme V. G.). Некоторые грибные болезни древесных пород на юго-востоке. [Some fungus diseases of tree species in the south-east.]—Науч.-тех. информ. Моск. лесотехн. Инст. [*Nauch.-tekh. inform. Moscow. lesotekh. Inst.*], *1955*, 8, pp. 56–63, 1955. [Abs. in *Referat. Zh. Biol.* 3, pp. 193–194, 1957.]

In a survey of the Derkul'sky forest belts in the south-eastern U.S.S.R. in 1951 the following fungi, usually saprophytic, were found to be parasitic on living trees: *Clithris quercina* [*Colpoma quercinum*: cf. 26, p. 362], *Cytospora* [*Valsa*] *intermedia* [35, p. 57], and *Septoria quercina* on oak; *Hysterographium fraxini*, very widespread but seldom killing the trees, and *S. besseyi* on ash; and *Cucurbita*[*ria*] *carganae*, *Pleonectria carganae*, and *Cytospora ruthenica* on yellow acacia.

Boyce (J. S.). **Sampling Oak wilt trees with an increment hammer.**—*Plant Dis. Reptr*, 40, 9, p. 822, 1956.

At the Southeastern Forest Experiment Station of the United States Department

of Agriculture, *Endoconidiophora fagacearum* [*Chalara quercina*] was isolated by the increment hammer method [34, p. 8] from eight of nine red oaks with suspected wilt.

Curl (E. A.). **Natural availability of Oak wilt inocula.**—*Bull. Ill. nat. Hist. Surv.*, 26, 3, pp. 277–323, 1 pl., 11 figs., 12 graphs, 1955. [Received April, 1957.]

In a study on the spread of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: 36, p. 287] in five major wilt areas in Illinois from October, 1952, to July, 1953, inclusive, the period of viability of conidia on artificially grown mycelial mats in high humidity was determined as 102 days at 0° and 12° C., but in low humidity [cf. 36, p. 142] it was at least 250 days at 0°, 12°, and 16°. Conidia on a natural mat kept in dry storage at 16° were still viable after 330 days. Nitidulidae were effective destroyers of the fungal mats [36, p. 71]. The development of macroscopic mycelium was readily induced in March, April, and May by making cuts through the bark of oaks approaching the mat-producing stage; this suggests an air relationship in mat formation.

The highest concentration of conidia on mats was found in December; numbers then decreased steadily until April, when a sharp rise occurred, followed by a rapid decrease, until in July none were found. In the laboratory the April conidia germinated best, though good germination was given by the October, November, and March collections. The highest average number of conidia was obtained from mature mats, but the highest germination rate from immature ones.

Of 393 mats presumed to be old enough to contain perithecia 23 per cent. did so. Mats with perithecia were found in all months covered by the study except July, and the highest average number on each was on ageing mats in May. The best germination rate of ascospores was given by those collected from ageing mats in April. Cells from mats of all ages were viable; 82 per cent. of the pads [33, p. 124] from immature mats yielded positive cultures.

Rhoads (A. S.). **The occurrence and destructiveness of Clitocybe root rot of woody plants in Florida.**—*Lloydia*, 19, 4, pp. 193–240, 10 figs., 1 map, 1956.

Most of the information contained in this review of the investigations carried out from 1924 to 1944 and intermittently thereafter on mushroom root rot (*Clitocybe tabescens*) of woody plants in Florida [32, p. 406; 35, p. 781 *et passim*] has already been noticed from time to time in this *Review*. There was no correlation between the incidence of the root rot and the pH of the soil and in pure culture neither the growth of *C. tabescens* nor that of *Armillaria mellea* was sufficiently limited by the reaction of the medium to suggest the possibility of control along these lines. The disease is absent from the typical flatwoods areas where pines and saw palmetto (*Serenoa repens*) are dominant.

Morrison (T. M.). **Mycorrhiza of Silver Beech.**—*N.Z. J. For.*, 7, 3, pp. 47–60, 7 figs., 3 graphs, 1956.

Studies at the Department of Botany, University of Otago, New Zealand, on the morphology and anatomy of the ectotrophic mycorrhiza of silver beech (*Nothofagus menziesii*) [33, p. 747] showed that they are similar in structure to those of beech [cf. 35, p. 839], that the endophyte or endophytes of the former are not restricted to soils in which *N. menziesii* trees are growing or have recently grown, and that the degree of mycorrhizal infection decreased as the light intensity was reduced from 100 per cent. The soil remained infective even after seven months' storage in an air-dry condition.

Growing mycorrhizal and non-mycorrhizal plants of *N. menziesii* and *Pinus radiata* in a similar series of soils showed that under infertile conditions no benefit resulted to the former from the association, whereas growth of *P. radiata* was

increased. In fertile soils both mycorrhizal and non-mycorrhizal *N. menziesii* and pine plants grew well.

Rovsky (V. M.). О радикальном методе борьбы с голландской болезнью Ильмовых. [Concerning a radical method of controlling Dutch Elm disease.] Бот. Журн. [*J. Bot. U.S.S.R.* = *Bot. Zh. S.S.S.R.*], 41, 10, pp. 1478–1481, 1956.

Much of this information on the occurrence of Dutch elm disease [*Ceratocystis ulmi*] in the U.S.S.R. has already been noticed from another source [18, p. 489]. In experiments carried out by the author since 1940 *U*[*lmus*] *pinnato-ramosa* was consistently resistant and in direct and back crosses with the susceptible *U. scabra*, *U. densa*, and *U. androssovii* produced hybrid forms of improved quality and increased disease resistance. It is suggested that these and similar forms and *U. pinnato-ramosa* should be used for afforestation purposes, thus avoiding mortality of trees and solving the problem of control.

Bouriquet (G.) & Brenière (J.). **Nouvelles observations sur la maladie chancreuse de l'Aleurites fordii à Madagascar.** [New observations on the canker disease of *Aleurites fordii* in Madagascar.]—*Rev. Path. vég.*, 34, 4, pp. 241–248, 1 pl., 1955. [Received 1956.]

The authors received from Madagascar branches of *Aleurites fordii* and of a wild plant, *Trema orientalis*, bearing apparently identical cankers, associated with a *Septobasidium* [*S. aleuritidis*: 32, p. 186] and different species of insects. The first batch of *T. orientalis* material bore *S. aleuritidis*, but on material received subsequently this could not be definitely identified. It is, therefore, not yet certain that the disease spreads to *A. fordii* from the wild host.

The insect species present on *A. fordii* are known to attack many different hosts in various parts of the world, sometimes in association with a *Septobasidium*, sometimes not. In the absence of the fungus the insects appear to cause less damage, and at present it appears that the canker disease of *A. fordii* in Madagascar is due to numerous cosmopolitan species of insects and is only important with the fungus present.

Diercks (R.). **Über den 'Rutenbrenner' (Physalospora miyabeana) an Korbweiden unter besonderer Berücksichtigung zweijähriger Bekämpfungsversuche.** [On the 'rod blight' (*Physalospora miyabeana*) of Basket Willows, with special reference to two years' control experiments.]—*Pflanzenschutz*, 9, 3, pp. 37–44, 10 figs., 1957.

In connexion with the steadily rising incidence of rod blight (black canker) of basket willows [*Salix* spp.] in the Freising district of Germany since 1951, the life-history of the causal organism, *Physalospora miyabeana*, is recapitulated with reference to the studies of Fukushi, who first observed it (*Ann. phytopath. Soc. Japan*, 1, pp. 1–12, 1921), and Nattrass in England [8, p. 274]. The symptoms of the disease in the affected area agree entirely with the description given by the latter, consisting of brown, later black, sharply defined lesions on the leaves, principally along the midrib; cortical necroses, often developing into extensive cankers involving the phloem and cambium; and die-back of the tips. These features resemble those of scab (*Fusicladium saliciperdum*) [14, p. 479], which was believed until recently to be the only dangerous parasite of willows in Germany [4, p. 644].

Up to the present the problem of control has been approached solely along hygienic lines with only partial success, and it appears that chemical treatments will be indispensable in future, at any rate locally. Promising results were obtained in experiments in 1956 by weekly applications from the beginning of July to the end of September of 0·4 per cent. captan and V.P. 1940 (Hoechst) [36, p. 541],

applied at a strength of 0·85 per cent. up to the fourth treatment and thereafter at 0·4, but it is not yet feasible to issue precise recommendations for their large-scale use.

Strobel (J.) & Vermillion (M. T.). **A preliminary study of an apparent disease of Hemlock (Tsuga canadensis (L.) Carr.) in the nursery.**—*Lloydia*, 19, 4, pp. 241–244, 2 figs., 1956.

A disease of Canadian hemlock (*Tsuga canadensis*) in a nursery in Athens county, Ohio, in 1953 caused slight brown spotting to complete necrosis of the needles, particularly on the lower branches, defoliation, and death of twigs and branches. Infection progressed upwards, sometimes affecting the entire plant. The disease was not observed in foreign plantings.

A species of *Cephalosporium* [cf. 33, p. 59] was isolated from twigs and needles and the symptoms were reproduced on potted hemlocks sprayed with a spore suspension, the fungus being reisolated. It is suggested that infested soil may be the source of primary infection, the fungus gaining entrance through wounds incurred during transplanting.

Jacquiot (C.). **Les champignons lignivores. Leur rôle dans la nature et leur importance technique.** [Lignivorous fungi. Their function in nature and their technical importance.]—*Nature, Paris, 1956*, 3258, pp. 395–400, 9 figs., 1956.

Among the species included in this useful summary of essential information on the occurrence and control, by hygienic measures and chemical protection [cf. 34, p. 417], of wood-destroying fungi in France are *Ganoderma applanatum*, *Ungulina fomentaria* [*Fomes fomentarius*], *U. annosa* [*F. annosus*], *Polyporus sulphureus*, *Gyrophana* [*Merulius*] *lacrymans*, and *Stereum sanguinolentum*. Aspects of the subject discussed comprise, *inter alia*, the chemical effects of attack on the wood; physical conditions requisite for infection; modes and mechanism of invasion; types of decay, stromata, and secondary changes; and symbiosis of fungi and insects.

Verrall (A. F.). **How to prevent fungus damage to wood structures.**—*For. Prod. J.*, 7, 1, pp. 15A–17A, 1957.

In this popular article on the general principles of wood preservation the author emphasizes the importance of moisture control through structural design.

Hof (T.). **Buitenproeven met geconserveerde palen.** [Field tests with preserved posts.]—*Ned. Boschb.-Tijdschr.*, 28, 9, pp. 207–215, 1 fig., 6 graphs, 1956. [English summary.]

This is a further report [cf. 34, p. 558] from the Timber Institute T.N.O., Delft, the Netherlands, on the performance under outdoor conditions of posts measuring 1·65 m. by 8 to 9 cm. of six tree species against decay [of unspecified origin]. The trials have now been in progress for eight to ten years, and so far creosote oil and pentachlorophenol (dissolved in a heavy oil), both pressure-impregnated, have conferred the greatest degree of protection on posts standing in soil near the Hague Forest, 's-Gravenhage. Brushing with carbolineum proved ineffectual, and, as already indicated, the results obtained with water-soluble compounds are variable.

No clear-cut differences between the posts subjected to the several treatments have yet been observed along the canal in the north-east polder or at the edge of a pond.

Blew (J. O.). **Comparison of wood preservatives in stake tests (1956 Progress Report).**—*Rep. For. Prod. Lab., U.S. Dep. Agric., For. Serv.* 1761, 7+42 [unnumbered] pp., 1 pl., 1956.

This further progress report on stake tests carried out by the Forest Products

Laboratory, Madison, Wisconsin [cf. 34, p. 331], discusses results obtained with untreated, pressure-treated, and non-pressure-treated stakes of southern yellow pine and with modified-wood plywood stakes. The 33 tables comprise an index of materials tested, 31 detailed reports of tests, and a summary of results obtained with wood preservatives in general use.

D'ANS (ANNA M.) & SCHULZE (B.). **Elektronenmikroskopische Untersuchungen an imprägnierten Hölzern.** [Electron-microscopic studies on impregnated timbers.]—*Holz a. Roh- u. Werkst.*, 14, 7, pp. 252–256, 11 figs., 1956.

At the Laboratory for Timber Protection Technology, Berlin-Lichterfelde, the electron-microscopic inspection of deposits of preservatives (zinc silicofluoride, potassium hydrogen fluoride, and mercuric chloride solutions) in pine sapwood blocks revealed measurable crystallized particles, the diameter of which decreased from the periphery to the interior of the impregnated zone. The particles could still be detected beyond the limit of the zircon-alizarin reaction. The particles were smaller in damp than in dry wood, the former being more rapidly and deeply penetrated by the solutions than the latter. The sizes of the individual particles were as follows: zinc silicofluoride 15 mμ, potassium hydrogen fluoride 10 to 20 mμ in the first sample and 20 to 400 in the second, and mercuric chloride (which formed elements of two dimensions) 5 and 70 to 100 mμ. Zinc silicofluoride and the first sample of potassium hydrogen fluoride also occurred as aggregates measuring 70 and 30 to 160 mμ, respectively.

GEWECKE (H.). **Die Frischimprägnierung von Masten aus Fichten- and Tannenholz nach dem Saftverdrängungsverfahren.** [The fresh impregnation of Spruce and Fir wood by the sap displacement method.]—*Holz a. Roh- u. Werkst.*, 15, 3, pp. 119–124, 5 figs., 1 diag., 1957. [English summary.]

The information in this paper has already been presented from another source [36, p. 152]. It is pointed out that the new method of impregnating spruce and fir [*Abies* spp.] poles by sap displacement obviates two disadvantages of the Boucherie process (from which it is adapted), namely, the protracted period of immersion, sometimes extending over weeks or even months, and the loss, amounting on an average to 50 per cent. or more in the author's plant, of the chemical solution through exudation of sap from the top end.

WILSON (W. J.). **The determination of zinc in wood preserving solutions.**—*Analyt. chim. Acta*, 15, 6, pp. 508–510, 1956. [French and German summaries.]

The method herein described for the determination of zinc in wood-preservative solutions by titration with ferrocyanide was developed at the Dominion Laboratory, Auckland, New Zealand. In compounds of the chromated zinc chloride, zinc-chrome-arsenate, and copper-zinc-chrome-arsenate types, chromate and copper interfere and are removed. Chromium is extracted with methyl *iso*-butyl ketone in 1:1 hydrochloric acid, and copper is then precipitated with cupferron and the zinc titrated in the filtrate.

A note is appended on the use of methyl *iso*-butyl ketone in connexion with the foregoing procedure.

NOWAK (A.). **Untersuchungen über die fungizide Wirkung einzelner Bestandteile verschiedener Steinkohlenteeröle.** [Studies on the fungicidal action of some components of different coal tar oils.]—*Holz a. Roh- u. Werkst.*, 14, 7, pp. 268–270, 2 figs., 1956.

This is a report from the Mödling Experiment Station, Vienna, on the assay of three coal tar oils, with phenol contents of 2·5, 4, and 9 per cent., respectively,

produced by the United Austrian Iron and Steel Works, Linz, for their capacity to protect pine sapwood blocks from attack by *Coniophora cerebella* [*C. puteana*] and *Lentinus squamosus* [*L. lepideus*]. With an absorption of 70 kg. oil per cu. m. absolute immunization against both species was attained. *C. puteana* was also completely repelled, and *L. lepideus* strongly inhibited, at 26 kg., irrespective of the phenol content of the different brands.

Scholles (W.). **Über die pilz- und insektenwidrigen Eigenschaften von Naphthensäuren und Metallnaphthenaten als Wirkstoffe in Holzschutzmitteln.** [On the anti-fungal and anti-insect properties of naphthenic acids and metal naphthenates as agents in wood preservatives.]—*Holz a. Roh- u. Werkst.*, 15, 3, pp. 128–137, 3 figs., 1 graph, 1957. [English summary.]

The results of experiments at the DESOWAG Chemical Company, Rheinberg, Germany, demonstrated the inefficiency of copper, zinc, lead, cadmium, and mercury naphthenates, especially the two first-named, and of two naphthenic acids, as wood preservatives against *Coniophora cerebella* [*C. puteana*], *Poria vaporaria*, *Lentinus squamosus* [*L. lepideus*], *Lenzites abietina*, *Merulius lacrymans*, and *Chaetomium globosum*, using the toximetric test-tube and wood-block methods of assay. According to the latter the *doses toxicae* for copper and zinc naphthenates are not lower than 20 kg. per cu. m. The inadequacy of the compounds was particularly striking in comparison with the highly efficacious low-chlorinated naphthalene and pentachlorophenol.

Kimmey (J. W.). **Rate of deterioration of fire-killed timber in California.**—*Circ. U.S. Dep. Agric.* 962, 22 pp., 1 fig., 12 graphs, 1 map, 1955. [Received 1956.]

At the California Forest and Range Experiment Station the rate and agents of deterioration in 523 fire-killed trees [cf. 23, p. 202] were studied from 1947 to 1949 in 16 burnt areas, ranging from freshly burnt to one 17 years old. The species present were *Pinus ponderosa*, *P. jeffreyi*, *P. lambertiana*, *Pseudotsuga menziesii* [*P. taxifolia*], and *Abies concolor*. Findings confirmed a previous study elsewhere [loc. cit.]. Two degrees of deterioration were observed: limited, caused by [unspecified] blue-staining fungi and affecting the sapwood; and general, due principally to wood-decaying fungi, the chief of which (on all five species) in order of importance were *Fomes pinicola* [30, p. 593], *Polyporus volvatus* [23, p. 202], and *P.* [*Polystictus*] *abietinus* [cf. 35, p. 799]. Minor damage was caused, amongst other fungi, by *Pholiota adiposa* [cf. 31, p. 51] on *A. concolor*, *Fomes officinalis* [23, p. 202] on all except the first two pines, and *F. annosus* [35, p. 84] on all except *Pinus lambertiana*.

There is little loss from deterioration in the first year but there may be some degrade caused by blue stain within that period. After three years only the larger trees contain sufficient sound wood to justify salvage.

Zabel (E.) & Bergmann (W.). **Auftreten, Erkennen und Bekämpfung von Molybdänmangel.** [Occurrence, recognition, and control of molybdenum deficiency.]—*Dtsch. Landw.*, 8, 3, pp. 133–138, 5 figs., 1 graph, 1957.

Some of the information in this useful survey of the authors' observations on molybdenum deficiency of cauliflower and other crucifers in Germany [36, p. 293] and of 46 contributions to the literature on the subject has already been noticed from other sources. In the Erfurt district cauliflower stands are affected over an area of some 36 ha. and the average reduction in yield is 50 per cent. A new hexa preparation (made by VEB Berlin-Chemie, Berlin-Adlershof) known as ruscalin sp, containing molybdenum and other trace elements, showed promise in controlling the disease [loc. cit.].

Williams (W. A.) & Ribie (D.). **Production of Sugar Beets following winter green manure cropping in California. I. Nitrogen nutrition, yield, disease, and pest status of Sugar Beets.**—*Proc. Soil Sci. Soc. Amer.*, 21, 1, pp. 88–92, 1 graph, 1957.

In one of the two field experiments on Yolo loam at Davis, California, where winter crops of barley and purple vetch (*Vicia atropurpurea*) were used as green manures, they contributed to a reduction in the incidence of dry rot canker (*Rhizoctonia* [*Corticium*] *solani*) in sugar beets [35, p. 143]. The percentages of infection following the two were 3·5 and 4·4, respectively, compared with 7·9 after fallow [33, p. 198], a significant difference at the 5 per cent. level.

Feucht (W.). **Über eine seltene Erkrankung der Zuckerrüben im Sommer 1955 und deren mögliche Ursachen.** [Concerning a rare disease of Sugar Beet in summer 1955 and its possible causes.]—*NachrBl. dtsch. PflSchDienst, Berl.*, 10, 8, pp. 165–169, 9 figs., 1 map, 1956.

In 1955 cold weather in spring delayed the sowing of sugar beet in the German Democratic Republic, and there was extensive [unspecified] rotting of the roots in heavy, wet, poorly aerated soils in a region lying between the centre and the south-west of the State. The condition was severe enough to cause wilting in midseason, though many plants recovered later by developing healthy secondary roots. The author considers that it may be identical with that described as 'girth scab' [*Actinomyces scabies*: 35, p. 569].

Nikolić (V. J.). **Mozaik Šećerne Repe.** [Mosaic of Sugar Beet.]—*Arh. poljopr. Nauk* [*Trans. Inst. Agron. Res.*], 9, 24, pp. 36–48, 4 figs., 1956. [English summary.]

Studies at the Institute for Plant Protection, Beograd, Yugoslavia, confirmed previous findings by other authors [12, p. 674; 27, p. 270] concerning the physical properties of sugar beet mosaic virus, except for those obtained by Pound [loc. cit.] with virus from Belgium, which does not lose its virulence until 144 hours at room temperature, compared with the usual 72 hours. It is suggested that the virus there differs from the virus under study in Yugoslavia. Control measures are described, the need for segregation of seedlings being stressed.

Aldrovandi (A.). **Una terrible minaccia per la bieticoltura italiana. Il giallume della Barbabietola da Zucchero.** [A formidable threat to Italian Beet cultivation. Sugar Beet yellows.]—*Industr. sacc. ital.*, 49, 9–10, pp. 193–194, 1956.

Beet yellows virus, hitherto so sparsely distributed in Italy [36, p. 79] as to have attracted scarcely any attention, is reported to have become virulent recently in the Avezzano region, where the suspected vector is the red spider mite, *Tetranychus telarius*. Other well-known vectors were not found locally.

Malmus (N.). **Die viröse Vergilbungskrankheit und ihre Bedeutung für den bayerischen Rübenbau.** [The virus yellows disease and its significance for Bavarian Beet cultivation.]—*Prakt. Bl. PflBau.*, 51, 4, pp. 127–134, 1 col. pl., 1956.

A general account is given of the symptoms and course of beet yellows virus disease in Bavaria and of control measures [36, p. 79 *et passim*].

Rietberg (H.) & Hijner (J. A.). **Die Bekämpfung der Vergilbungskrankheit der Rüben in den Niederlanden.** [The control of Beet yellows disease in the Netherlands.]—*Zucker*, 9, 19, pp. 483–485, 1956.

During the period from 1943 to 1955 the incidence of beet yellows virus recorded on 1st September in the Netherlands [35, p. 740] ranged from 3·4 to 61·4 per cent.,

the peak being in 1945. In certain parts of the country the disease is more prevalent than elsewhere every year. In 1948, for instance, the average for the country as a whole was 8·9 per cent., in the province of Groningen 1·9, in the south-western zone of cultivation 10·3, and in the province of Limburg (adjoining the main German centres of infection in the Rhine Valley) 26·6; the corresponding figures for 1951 were 30·4, 11·4, 31·5, and 61·5 per cent.

It has been shown that in certain areas the clearance of fodder beet clamps by 1st April results in a drastic reduction of infection. Although attention is paid to correct timing and spacing in seed sowing, very heavy infection (often reaching 100 per cent.) is unavoidable even with the best of care in districts exposed to heavy summer flights of aphids, and supplementary measures are essential. In large-scale experiments in Limburg during 1955 two applications of systox reduced the incidence of infection by roughly 50 per cent. and increased the beet yield by 30 to 40 doublecentners per ha. In this area, therefore, chemical treatment may be regarded as profitable, and the writers are of opinion that one application at any rate should be a normal annual practice here and in eastern Brabant.

Breeding experiments have been in progress since 1948 at the Institute for Rational Sugar Production, Bergen-op-Zoom, and although complete immunity has not yet been achieved, selections have been developed in which yield reductions from the heaviest infection do not exceed 14 to 16 per cent.

Nour (M. A.). **Control of powdery mildew diseases in the Sudan, with special reference to Broad Bean.**—*Emp. J. exp. Agric.*, 25, 98, pp. 119–131, 1957.

The more important crops attacked by powdery mildews in the Republic of the Sudan include broad bean by *Erysiphe polygoni* and other species [36, p. 319]; carrot, by *Leveillula taurica* and *E. polygoni*; safflower and *Cicer arietinum*, both by *L. taurica*; and vegetable marrow, pumpkin, cucumber, and melon, all by *Sphaerotheca fuliginea* [cf. 33, p. 411; 34, p. 137].

In spraying and dusting experiments, mainly on broad beans, control of *L. taurica*, *S. fuliginea*, and *E. cichoracearum* was obtained with commercial preparations of lime-sulphur, water-dispersible sulphur, sulphur dust, thiram, and cuprous oxide. Early sowing combined with lime-sulphur treatments at low concentrations (1 in 120) greatly increased yields of broad beans at two experimental centres. Phytotoxic effects were caused by the higher concentrations of some of the sulphur fungicides.

Van der Giessen (A. C.) & Van Steenbergen (A.). **A new method of testing Beans for anthracnose.**—*Euphytica*, 6, 1, pp. 90–93, 3 figs., 1957. [Dutch summary.]

At the Institute of Horticultural Plant Breeding, Wageningen, Netherlands, a new method, based on previous principles but simpler and cheaper, for testing bean [*Phaseolus vulgaris*] seedlings for resistance to anthracnose (*Colletotrichum lindemuthianum*) [35, p. 659] has been developed. Young seedlings with the testa removed are sprayed with a spore suspension while growing on sheets of filter paper (each one in a hole) stretched over perforated zinc or fine wire frames which fit into zinc- or plastic-lined wooden containers with a shallow layer of water. Temperature is maintained at 15° to 22° C. and high humidity is obtained by covering with plastic for four days. The fungus sporulates well on peptone agar. Resistant plants (healthy or with one brown spot) can be selected seven to ten days after inoculation.

Labaw (L. W.) & Wyckoff (R. W. G.). **The structure of southern Bean mosaic virus protein crystals.**—*Arch. Biochem.*, 67, 1, pp. 225–236, 7 figs., 1957.

It was demonstrated by measurements on a series of over 500 electron micrographs of southern bean mosaic virus protein at the National Institute of Arthritis

and Metabolic Diseases, Bethesda, Maryland, that their molecules are disposed in a cubic close-packed arrangement. The edge length of the tetramolecular unit cube is $a_0 = 345$ Å, corresponding to a dried particle diameter of 245 Å. The irregularity in outline of many of the crystals, which is illustrated, is attributed in part to their ready cleavage, leaving surfaces whereon more complicated faces can develop with continued growth.

Kristensen (H. R.) & Christensen (M.). **Løg-Mosaiksyge.** [Shallot mosaic disease.]—*Tidsskr. Planteavl*, 59, 3, pp. 530–547, 1 fig., 1955. [English summary.]

Information is presented on the geographical distribution of onion yellow dwarf virus [map 46], and the latest results of experimental studies relating to its occurrence on shallots in Denmark [29, p. 6 *et passim*] are reported. The minimum incubation period for transmission by mechanical sap inoculation to shallot was 15 days and to onion 10. Transmission was also effected by *Myzus persicae* [cf. 33, p. 401], which appears to be of great importance in the natural spread of the disease in certain parts of the country, e.g. at the Lyngby (Copenhagen) Plant Protection Station.

Wounding of the bulbs by various methods of incision and their treatment with rindite [34, p. 245] during dormancy markedly accelerated sprouting, thereby enabling representative samples of field inspected material to be tested in the winter.

Scott (M. R.). **Studies of the biology of Sclerotium cepivorum Berk. I. Growth of the mycelium in soil. II. The spread of white rot from plant to plant.**—*Ann. appl. Biol.*, 44, 4, pp. 576–583, 2 graphs; pp. 584–589, 1 fig., 2 graphs, 1956.

In studies at the University of Birmingham on the development of the mycelium of *Sclerotium cepivorum* [cf. 33, p. 134 *et passim*], using the Cholodny soil-tumbler technique (*Arch. Mikrobiol.*, 1, p. 620, 1930) [12, p. 324], the failure of the fungus to grow from agar into unsterile soil, its limited growth into such soil from infected onion tissue (dependent on the food reserves in the inoculum), and its slow growth in sterile soil, even with organic supplements, showed it to be unsuited to an independent existence in natural soil (which also contains micro-organisms antagonistic to it) and to be a root- rather than a soil-inhabiting fungus [cf. 29, p. 420].

In the second paper experimental evidence is adduced showing that *S. cepivorum* spreads more rapidly in the field between onion plants in root contact than between separated plants, the number of plants infected over a range of spacing distances being approximately inversely proportional to the spacing. The fungus invades the bulbs through the roots; no spread from plant to plant occurred when the bulbs and roots of inoculated plants were enclosed in nylon bags (which barred the growth of the roots, but not of the fungus).

Simons (J. N.). **Three strains of Cucumber mosaic virus affecting Bell Pepper in the Everglades area of south Florida.**—*Phytopathology*, 47, 3, pp. 145–150, 1 fig., 1 diag., 1957.

Three strains of cucumber mosaic virus isolated from chilli peppers were studied at the Everglades Experiment Station, Florida [cf. 35, p. 510]. The commonest and most severe is southern cucumber mosaic virus [34, p. 699]; the other two are widespread but sporadic, one causing necrotic oak-leaf patterns on older foliage and sometimes inducing red or yellow fruit blisters, the other (least common and mildest) inducing a calico-like leaf mottle [cf. 36, p. 9] but no fruit symptoms. All three produced systemic symptoms in beet, zinnia, cucumber, and several species of Solanaceae. Southern cucumber mosaic virus alone induced such symptoms on *Commelina* sp. and celery; none of them caused symptoms on China aster, cabbage, or a number of legumes. All three proved immunologically related in cross

protection tests. The physical properties, thermal inactivation at 65° to 70° C., and a dilution end point between 1 in 10,000 and 1 in 20,000 were the same for all. All were non-persistent in *Aphis gossypii* and *Myzus persicae*, the latter transmitting somewhat better, but the degree of vector transmission differed considerably between virus strains; chilli was a more potent source of inoculum than cucumber.

Simons (J. N.). **Effects of insecticides and physical barriers on field spread of Pepper veinbanding mosaic virus.**—*Phytopathology*, 47, 3, pp. 139–145, 3 figs., 5 graphs, 1957.

Trials were carried out during autumn and spring, 1954–5, at the Everglades Experiment Station, Florida, to investigate the spread of [chilli] pepper vein-banding mosaic virus [35, p. 574] and means of checking it. Inoculated *Solanum gracile* was used as the virus source for California Wonder chillies set out as in commercial plantings. The use of fortnightly sprays of parathion or demeton to kill the aphid vector (*Aphis gossypii*) gave no apparent control on the crop but two applications of 25 per cent. parathion emulsion (1·5 pints per 100 gals. water) at three-day intervals to one of two 40 ft. rows of the *S. gracile* set in line 150 ft. apart gave significant reduction of virus spread into 12 rows of potted chilli plants 4 ft. apart parallel to the sprayed *S. gracile* hedge, compared with the plants near the unsprayed hedge. The plants were left in the field for 6 days before returning to the greenhouse to complete incubation of the virus. The plots were surrounded by clean cultivation.

In the autumn a distance of 150 ft. almost checked primary spread, but in the warmer spring weather this distance only reduced it to 3 or 4 per cent. Sometimes the virus was carried 400 ft. and occasional carriage over 800 to 1,000 ft. was indicated by observations in the spring of 1956.

In another experiment similarly arranged plots, with appropriate controls, were bordered by sunflower hedges. This barrier reduced virus spread from 95 to 63 per cent., a result that was not significantly bettered by spraying the barriers with demeton. Spread to chilli in the middle of the plots was twice as quick as to those next to the sunflowers. To control primary spread of the virus removal of the weed source and the use of barriers are thus seen to be advisable. Control of secondary spread within the crop has yet to be achieved.

Alvarez L. (E.) & Richardson (R. W.). **La Lechuga. Indicaciones generales para su cultivo.** [Lettuce. General directions for its cultivation.]—*Foll. Divulg. Secret. Agric. Méx.* 22, 35 pp., 14 figs., 1956.

The diseases of lettuce in Mexico, dealt with on pp. 32–34 of this publication, are of minor importance, owing to the use of resistant varieties and the small scale on which the crop is cultivated. Amongst those observed are: brown blight [cf. 19, p. 324], leaf burn [? tip burn: cf. 35, p. 265], mosaic [? lettuce mosaic virus: cf. 35, p. 67], [tomato] spotted wilt virus [map 8; cf. 35, p. 809], anthracnose (*Marssonina panattoniana*) [map 82], and grey mould (*Botrytis cinerea*) [cf. 8, p. 635].

Rood (P.). **Relation of ethylene and post-harvest temperature to brown spot of Lettuce.**—*Proc. Amer. Soc. hort. Sci.*, 68, pp. 296–303, 1 fig., 2 graphs, 1956.

In studies at the United States Department of Agriculture, Fresno, California, brown spot of lettuce [34, p. 569] was induced by low concentrations of ethylene in the storage atmosphere. Injury from either ethylene or apple volatiles was most marked when the storage temperature during the ten days after harvesting was about 44° F. At 32° injury was slight. When lettuces were stored with apples the ethylene fraction of the apple volatiles was primarily responsible for the spotting. Lettuces harvested when moderately firm were less susceptible to ethylene injury than firm or hard ones.

KILPATRICK (R. A.). **Fungi associated with the flowers, pods, and seeds of Soybeans.** *Phytopathology*, 47, 3, pp. 131–135, 2 figs., 4 graphs, 1957.

Studies were made from 1951 to 1955 at the Delta Branch Experiment Station, Stoneville, Mississippi, of the fungi associated with the pistil and stamens, style and stigma remains, and seed of soybean flowers and fruits [cf. 32, p. 603]. These varied with the season, location on the plant, and its variety. *Alternaria* spp. were commonest on the flower parts examined, even in unopened flowers, comprising 65 per cent. of the total isolates; *Cercospora kikuchii* [35, p. 576] was the principal fungus obtained from seed in the pods (50 per cent.). Seed infection, lowest before maturity, gradually increased thereafter, 66 per cent. of the varieties sampled having 100 per cent. infection six weeks after maturity (this level being reached sooner in early maturing varieties); in 45 per cent. of them half the seed was infected at maturity, the figure for the variety CNS being 100 per cent. before maturity. Fungi apparently gain entry to the seeds in unopened pods through the cracking of the walls, insect injury, or from systemic infection, the last being indicated by the more frequent isolation of fungi from seeds at the peduncle end of the pod.

STEWART (R. B.). **An undescribed species of Pyrenochaeta on Soybean.**—*Mycologia*, 49, 1, pp. 115–117, 1 fig., 1957.

Since 1953 soy-beans, not commonly grown in Ethiopia but cultivated experimentally at the Jimma Agricultural Experiment Station, have shown an increasing amount of leaf spotting, the most prevalent disease locally, caused by a hitherto undescribed species of *Pyrenochaeta*, *P. glycines* n. sp., with pycnidia 110 to 160 μ in diameter and hyaline (greenish-yellow in mass), oval to short-cylindrical, straight to slightly curved pycnidiospores measuring 2 to 3 by 4·5 to 7·5 μ.

The spots appear as small, dark reddish-brown, circular to irregular lesions. The older ones are necrotic, grey to dark brown in the centre, and have a dark brown, almost black, narrow border. Some lesions are surrounded by a chlorotic halo. The centre, sprinkled with small, black pycnidia visible macroscopically, may fall out in old lesions. The spots measure up to 2 cm. in diameter, but may coalesce and cover the greater part of the leaf surface. The affected leaves become chlorotic and fall. Varieties with pale leaves are generally more susceptible than those with dark ones. The fungus was also found on uncultivated *Glycine javanica* in the vicinity.

BAUDIN (P.). **Maladies parasitaires des Ignames en Côte d'Ivoire.** [Parasitic diseases of Yams in the Ivory Coast.]—*Rev. Mycol., Paris*, 21, *Suppl. colon.* 2, pp. 87–111, 1 pl. (facing p. 148), 1 fig., 1956.

Notes are given on the principal fungus diseases affecting the leaves, stems, collar, and tubers of yams in the Ivory Coast. The commonest is anthracnose (*Glomerella cingulata*). *Corticium* [*Sclerotium*] *rolfsii* produces blotches on the leaves and attacks the collar also. Leaf spots are caused by *Phyllosticta dioscoreicola*, *P. dioscoreae*, *Cercospora ubi*, *Mycosphaerella dioscoreicola*, and *Pestalotiopsis cruenta*. *Rhizopus nodosus* is responsible for a soft rot and *Sphaerostilbe repens* [map 288] for a dry rot of the tubers. The importance of diseases of this crop locally would be much reduced by improved cultural practices and planting each species or variety at the time best suited to it.

CIFERRI (R.). **Malattie e parassiti della Vite. V^e^ Corso di aggiornamento per i viti-vinicoltori dell' 'Oltrepo' pavese (1956).** [Diseases and parasites of the Vine. Fifth course of instruction for Vine-growers of the Pavia area of the Po valley (1956)].—47 pp., Pavia, Camera di Commercio, Industria, e Agricoltura, 1956.

This pamphlet contains the substance of two lectures given by the author to vinegrowers of the Po valley in January 1956, and covers in popular terms the latest developments in the control of the major vine diseases, including nutritional

deficiencies and infectious degeneration [court-noué], all noticed in this *Review* from time to time.

Hewitt (W. B.) & Gifford (E. M.). **Symptoms for identifying fanleaf in dormant Grapevines.**—*Bull. Calif. Dep. Agric.*, 45, 3, pp. 249–252, 1 fig., 2 graphs, 1956.

Analysis of three vine varieties at the University of California, Davis, showed that when infected by fanleaf [court-noué: 34, p. 343] the canes have a high frequency of deformities. Occurrence of short internodes and double nodes in the ratio of one to every other cane is good evidence of the presence of fanleaf, which together with other symptoms, such as fasciation and zigzag growth, should enable the grower to recognize the plants to be destroyed.

Brückbauer (H.). **Erneutes Auftreten des 'schwarzen Brenners'.** [Renewed occurrence of 'anthracnose'.—*Dtsch. Weinb.*, 9, p. 659, 1954. [Abs. in *Z. PflKrankh.*, 64, 3, p. 157, 1957.]

With the introduction of copper-containing fungicides anthracnose of the vine (*Gloeosporium ampelophagum*) [*Elsinoe ampelina*] disappeared from Germany, where it had not been observed since 1909 [14, p. 557] until the spring of 1954, when an attack occurred in a nursery of American stocks in the Pirmasens district. The symptoms, causal organism, effects, and control of the disease are briefly described.

Spraying for black spot and downy mildew of Grapes.—*Agric. Gaz. N.S.W.*, 67, 11, pp. 585–586, 1 fig., 1956.

The incidence of the two main vine diseases in New South Wales, black spot (*Elsinoe ampelina*) [34, p. 283] and downy mildew [*Plasmopara viticola*: 35, p. 354], has recently increased owing to wet weather. Ziram and thiram are highly effective against *E. ampelina*. Bordeaux mixture 6–6–100 gives good control of *P. viticola* but sometimes causes a leaf scald in weak plants, probably due to excess copper. Zineb and ziram are recommended where such scald is likely to occur though they are less effective than Bordeaux mixture in exceptionally wet seasons.

Thiel (A.). **Vorläufiges Ergebnis eines zweijährigen Spritzversuches mit organischen Fungiziden im Vergleich zu Kupfer (II, III).** [Preliminary result of a two-year spray test with organic fungicides in comparison with copper (II, III).]—*Weinberg u. Keller*, 3, pp. 257–259, 357–366, 10 graphs, 1956.

Part II of this paper [cf. 36, p. 302] deals with the economics of spraying vines against *Plasmopara viticola* in the Moselle Valley, Germany, in 1954 and 1955, and part III with the influence of organic fungicides on ripening of the wood. In both years 0·5 per cent. lutiram plus 0·1 per cent. wettable sulphur produced the largest increases of yield in comparison with other treatments. Thus, in 1954 the plots sprayed four times with lutiram produced 70·08 doppelzentners per ha. of 8,264 stocks, while none of the three copper-lime or copper treatments yielded more than 53; the corresponding figures for 0·2 per cent. dithane plus 0·1 per cent. wettable sulphur, and fuclasin-ultra were 65·95 and 64·21. The financial gains from the use of lutiram, dithane, and fuclasin-ultra were computed at over DM. 1,247, 1,002, and 903 per ha., respectively.

In 1955 the vines sprayed with the same three fungicides yielded, respectively, 59·42, 55·7, and 51·15 dz. per ha. as against 41 and 39 for copper-lime and copper, resulting in gains of DM. 1,912, 1,592, and 1,100, respectively.

A further series of tests during 1955–6 showed that lutiram, polyram, orthocide, and dithane generally promoted more vigorous and uniform growth of the wood than copper, but fuclasin-ultra was less satisfactory. These experiments, however,

are to be continued for some years so that the permanent effects of the organic compounds can be gauged.

Boubals (D.). **Sur le comportement des Vitacées a l'égard du mildiou de la Vigne (Plasmopara viticola B. et C. Berl. et de T.). Sur le comportement du mildiou de la Vigne (Plasmopara viticola B. et C. Berl. et de T.) lors d'inoculations de cultures de tissus de Vitacées.** [On the behaviour of the Vitaceae with regard to Vine mildew (*Plasmopara viticola* (B. & C.) Berl. & de T.). On the behaviour of Vine mildew (*Plasmopara viticola* (B. & C.) Berl. & de T.) on the inoculation of tissue cultures of Vitaceae.]—*C. R. Acad. Sci., Paris*, 244, 11, pp. 1535–1537, 2 figs.; 13, pp. 1816–1818, 1957.

The results of a study on the causes of resistance to infection by *Plasmopara viticola* in certain Vitaceae are described from observations on inoculated detached leaves of *Cissus carnosa*, *C. quadrangularis*, *Vitis rotundifolia*, *V. rubra*, *V. riparia*, and *V. rupestris* (listed in order of decreasing resistance), in comparison with the cultivated European vine.

At 24° to 25° C. actively motile zoospores were liberated an hour after the deposition of sporangial suspensions (in twice-distilled water) on the lower leaf surfaces. Two hours later the zoospores ceased to move and began to form germ-tubes, which were completed in a further two hours, together with a vesicle and the inception of the mycelium proper. In the resistant species localized brown necroses appeared 16 to 20 hours after inoculation in the stomatal cells penetrated by the germ-tubes, in some cells of the stomatal chamber, and sometimes extended into the palisade tissue. In the three most resistant species the development of the mycelium was consistently arrested after the appearance of the necroses and it also became necrotic, whereas in the more susceptible ones growth continued outside the necrotic zone.

It appears from these findings that the peristomatal necroses developing shortly after the establishment of infection in resistant varieties are capable of exerting a more or less powerful fungitoxic action.

However, it was demonstrated by subsequent experiments, using Morel's technique [25, p. 94], that another factor is also involved. Thus, in the highly susceptible European vine and *V. lincecumii* the intercellular mycelium developed profusely in the cortical parenchyma, phloem, and medullary rays formed while the branch was still attached to the plant, and in newly produced phloem and ray tissue. In less susceptible species, e.g., *V. berlandieri* and *V. rupestris*, the mycelium was localized in the same zones but was relatively sparse, while only occasional fragments of mycelium, without aerial hyphae or conidiophores, were detected in the cortical parenchyma and cambium. At the end of a period ranging from 20 days to more than a month, the calluses invaded by the fungus appeared to be necrosed. The mycelium was unable to develop on the calluses of *C. carnosa*, *Parthenocissus quinquefolia*, *Ampelopsis brevipedunculata*, and *V. rotundifolia*.

It seems evident from these findings that the extension of the intercellular and aerial mycelium is limited by some process acting with variable intensity in the different species.

Smith (K. M.) & Lauffer (M. A.). **Advances in virus research. Volume IV.**—ix+ 340 pp., 5 figs., 7 graphs, New York, Academic Press Inc., London, Academic Books Ltd., 1957.

The nine contributions (each with an extensive bibliography) to the fourth volume of this series [cf. 35, p. 344] include those dealing with factors in virus evolution, by C. H. Andrewes (pp. 1–24); bacteriophages as genetic and biochemical systems, by A. D. Hershey (pp. 25–61); attachment and penetration of cells by viruses, by L. J. Tolmach (pp. 63–110); the anatomy of tobacco mosaic

virus, by N. W. Pirie (pp. 159–190); effects of non-ionizing radiations on viruses, by A. Kleczkowski (pp. 191–220); effects of changing temperature on plant virus diseases, by B. Kassanis (pp. 222–241); and mechanical transmission of plant viruses, by C. E. Yarwood (pp. 243–278).

Roland (G.). **État actuel des connaissances relatives aux maladies à virus des plantes.** [The present state of knowledge relating to virus diseases of plants.] — *Ann. Gembl.* (*1957*), pp. 13–32, 1957.

The author reviews and discusses in a general way the present state of knowledge relating to plant virus diseases [cf. 35, p. 745; 36, p. 168], a brief historical survey being followed by sections dealing with identification, biochemistry, morphology, multiplication, nomenclature, and control. A bibliography of 36 titles is appended.

Markham (R.). **Plant virus diseases and their identification.**—*Endeavour*, 16, 62, pp. 99–106, 5 col. pl., 1957.

Twenty-eight coloured illustrations of plant virus diseases are presented to give an idea of virus symptoms, with brief notes on nomenclature, types of symptoms, and methods of identification.

Ross (A. F.). **Viruses: the versatile parasites II. Responses of plants to concurrent infection by two or more viruses.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 19, 3, pp. 236–243, 1957.

In this paper (one of three presented at a joint meeting of the Section of Biology and the Division of Mycology on 10th December, 1956), the author discusses the information contained in 18 contributions to the subject indicated in the title, nearly all of which have already been noticed in this *Review*. The matter is arranged under the following headings: responses of plants infected by one virus to inoculation with another virus; responses immediately following simultaneous inoculation with more than one virus; and virus multiplication and symptom development in plants infected by one or more viruses.

Bonnemaison (L.). **Possibilités d'emploi des insecticides endothérapiques en vue de la protection des plantes contre les maladies à virus.** [The possibilities of using systemic insecticides to protect plants against virus diseases.]—*Ann. Inst. Rech. agron.*, Sér. C (*Ann. Épiphyt.*), 7, 4, pp. 563–640, 22 graphs, 1956.

A full account is presented of field and laboratory experiments conducted at the Central Station of Agricultural Zoology, Versailles, to ascertain whether treatments applied to plants with the systemic insecticides schradan, demeton (thiophosphate of diethyl and ethylthioglycol), and isolan (isopropylmethylpyrazoledimethylcarbamate) tested in comparison with parathion and oleoparathion, were likely to prove of use in the control of plant virus diseases. In the first series of tests Aguadulce broad bean seeds, Desprez sugar-beet stecklings, and potato and dahlia tubers were treated by soaking in the test materials, the effects on emergence, plant growth, and control of *Aphis fabae* being noted. In the second series the influence of spraying the plants with the insecticides on the control of *A. fabae* on broad beans and of *Myzus persicae* and *Brevicoryne brassicae* on cabbage and rape was determined. The effects of sprinkling the insecticides on the soil were also investigated.

In a third series of experiments the insecticides were tested for their effects on the control of beet yellows virus and the potato virus diseases leaf roll, virus A, virus Y, and aucuba mosaic.

The results indicated that steeping of seeds, roots, and tubers did not give satisfactory control of *A. fabae*, though seed dusting with powders containing a high percentage of the active ingredient would seem to show promise. The use of systemic insecticides against beet yellows virus [35, p. 60] is not satisfactory, at least

in northern France and in the Paris basin, and is only to be recommended when an important focus of infection is present and conditions favour an early spread of the virus to late crops in a dry spring. The best method of control is to sow beet early, and if a heavy infestation by *A. fabae* occurs dust with parathion or lindane or spray with parathion. Beet stecklings should not be planted after 15th to 20th July, and the plants should be given one to three applications of demeton between the end of August and the middle of October.

The treatment of seed potatoes with systemic insecticides should be forbidden until proof has been obtained that toxic products do not pass into the tubers.

Bradley (R. H. E.). **Effects of depth of stylet penetration on aphid transmission of Potato virus Y.**—*Canad. J. Microbiol.*, 2, 6, pp. 539–547, 1956.

In further studies at the Fredericton Laboratory, Canadian Department of Agriculture, on the transmission of potato virus Y by *Myzus persicae* to and from White Burley tobacco [35, p. 785] the highest percentage of aphids became infective when a preliminary period of starvation was followed by superficial insertion of the stylet into the source plants. This was determined by anaesthetizing the aphid *in situ* and measuring the extension of the stylets. Few acquired the virus when the stylet penetrated beyond the epidermis and none obtained it from the deeper tissues when the virus in the superficial layer was inactivated by ultra-violet irradiation. When the epidermis was removed from infected plants, the aphids acquired the virus as readily from the exposed mesophyll as from the detached epidermis. The placing of a membrane (epidermis of other plants or parafilm) over infected tobacco leaves did not greatly impede the feeding of aphids but reduced the number that became infective. Infective aphids rarely transmitted the virus through a membrane to healthy plants, though those that had penetrated a membrane were later able to infect an uncovered plant.

Protsenko (A. E.). Вирусные и вирусоподобные болезни растений Главного Ботанического Сада. [Virus and virus-like plant diseases of the Central Botanical Garden.]—Бюлл. бот. Сада, Москва [*Bull. bot. Gdn, Moscow*], *1957*, 27, pp. 98–107, 7 figs., 1957.

During a recent disease survey in the Central Botanical Garden, Moscow, U.S.S.R., a number of virus or virus-like diseases was found on 73 genera (22 families) of which 59 displayed mosaic and 14 yellows symptoms. The diseases are listed with annotations under the host family. None of the viruses was identified by transmission experiments or by properties.

Report of the First Meeting of the Plant Protection Committee for the South East Asia and Pacific Region. Held in Bangkok, Thailand, 3–7 December, 1956.—33+4 pp., Rome, Food and Agriculture Organization of the United Nations, 1957. [Mimeographed.]

On pp. 9 to 24 of this report details are given of the existing quarantine activities of each of the governments participating in the Plant Protection Agreement for the South East Asia and Pacific Region, approved by the Council of the Food and Agriculture Organization of the United Nations in 1955 and brought into force on 2nd July, 1956.

Referring to the implementation of the Agreement, reference is made to arrangements undertaken for co-operative action in quarantining rubber and other plants entering the area, especially from the American tropics. Certain modifications are made in the list of important pests and diseases not as yet recorded in the area, including the deletion of *Puccinia polysora*, now known to occur within it [36, p. 523]. Particular measures are also recommended to regulate the movement of material of certain crop plants within the area.

Outbreaks and new records.—*F.A.O. Pl. Prot. Bull.*, 5, 6, pp. 93–96, 2 figs., 1957.

E. Gram reports that *Cucumis* virus 2 [cucumber green mottle mosaic virus: cf. 35, pp. 269, 580], not before recorded in Denmark, caused much damage to cucumbers growing in a hothouse there in 1956. *Ascochyta citrullina* [*Mycosphaerella melonis*: cf. 33, p. 655], formerly considered uncommon and harmless in Denmark, was highly destructive in some cucumber hothouses; spraying with copper oxychloride at 7 to 8 lb. per acre gave good protection.

R. J. Ticho records that psorosis virus disease of citrus was found on the Altamira estate near San Salvador, Salvador; all the affected trees were at once eradicated. This is the first record of the disease in Central America.

A. R. Al-Adhami and R. D. Watson state that a disease causing defoliation and die-back of peach in Iraq during the past two years was tentatively identified as yellow red virus disease of peach (also called western X in the United States of America) [peach western X disease virus: cf. 35, p. 688].

T. N. Kaul, writing from Lalmandi Srinagar, Kashmir, states that the most important disease of rice locally, 'rai disease', is a combination of blast (*Piricularia oryzae*) and stem rot (*Sclerotium oryzae*) [*Leptosphaeria salvinii*]. While introductions from China are resistant, local varieties were seriously damaged in 1956. Bunt (*Tilletia foetida*) is very common on wheat. Maize smut (*Ustilago zeae*) [*U. maydis*] causes heavy losses in the Kashmir Valley. A very severe outbreak of maize leaf blight (*Helminthosporium turcicum*) occurred in 1956. The only major disease attacking potatoes is early blight (*Alternaria solani*). Rather serious losses are caused to apples by scab (*Venturia inaequalis*); mildew (*Podosphaera leucotricha*) is severe annually in many orchards; fly speck disease (*Leptothyrium pomi*) was prevalent in 1956.

Sibilia (C.). **Rassegna dei casi fitopatologici più notevoli osservati nel 1955.** [Review of the most noteworthy phytopathological records observed in 1955.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 14 (*1956*), pp. 153–174, 2 figs., 1957.

This report from Italy [cf. 36, p. 6] mentions, among others, the following diseases: vine powdery mildew (*Uncinula necator*) [cf. 35, p. 74], very severe in all areas, the outbreak being one of the worst experienced; leaf infection of olives near Rome and Terni by *Cercospora cladosporioides* [cf. 35, p. 531]; *Fusicladium dendriticum* var. *eriobotryae* [*F. eriobotryae*: cf. 33, p. 208] on loquats at Lecce; peach branch gummosis at Chiavari due to *Clasterosporium carpophilum* [cf. 34, p. 19]; *Coniothyrium wernsdorffiae* [cf. 34, pp. 38, 368] on rose branches from Cercemaggiore (Campobasso); *Ramularia cynarae* [cf. 34, p. 108] on globe artichokes near Rome; 'fire' (*Marssonina panattoniana*) of chicory near Pescara [cf. 35, p. 573]; fruit wilt (*Alternaria tenuis*) of chilli at Nettuno [35, p. 575]; and carnation collar rot (*Fusarium dianthi*) [cf. 34, p. 37] near Bolzano.

Tweede Jaarverslag Proefstation voor de Groenteteelt in de volle grond in Nederland 1956. [Second annual report of the Experiment Station for Outdoor Vegetable Culture in the Netherlands, 1956.]—59 pp., 7 figs., 1 diag., 7 graphs, 1 map, 1957.

The sections of this report [cf. 35, p. 659] dealing with grafting and varietal research (pp. 35–45) and with pests and diseases (pp. 50–54) contain, *inter alia*, the following items of phytopathological interest. Of 2,300 clones of second-year potato seedlings produced by 42 crosses, 18 carried one or more factors for resistance to *Phytophthora infestans*.

A number of crosses between commercial bean (*Phaseolus* [*vulgaris*]) varieties and *P. dumosus* yielded plants showing resistance to *Colletotrichum* [*lindemuthianum*], combined in a few instances with a similar reaction to halo blight [*Pseudomonas medicaginis* f. sp. *phaseolicola*] and stipple streak [tobacco necrosis virus]. Field resistance to stipple streak was observed in the Imuna and Processor varieties

in a heavily infected experimental plot. In over 40 tests to determine the suitability of certain varieties for cultivation in different parts of the country, Dubb. W. Zr. dr. [Double Stringless White] generally gave the best results, but its susceptibility to roll mosaic [bean mosaic virus: 35, p. 262] reduces its value in the south, where infection develops early in the season, and in Belgium (where eight experiments were also conducted). Processor outyields Double Stringless White in favourable years, but the great susceptibility of the former to *C. lindemuthianum* necessitates frequent treatments with zineb.

For three years in succession no tangible results have been achieved in studies of *C. fuscum* on *Digitalis lanata* [cf. 35, p. 124], as the fungus made practically no appearance, and they are accordingly to be discontinued, especially in view of the almost universal application of the highly effective hot-water seed treatment.

In experiments in two localities to determine the permissible interval between two treatments with maneb for the control of *Marssonina panattoniana* on endive, 10 days proved to be too long, 14 or 17 resulting in a total loss of efficiency.

None of the chemicals tested against peppermint rust (*Puccinia menthae*) gave such good control as 10 minutes' immersion of the rhizomes in water heated to 42·5° C.

Plant disease survey for the twelve months ending 30th June 1956. Twenty-sixth Annual Report N.S.W. Department of Agriculture. Biological Branch—Division of Science Services.—36 pp., 1 map, [? 1956. Mimeographed.]

In this report [cf. 35, p. 877; 36, p. 455] it is stated that the epidemic of wheat stem rust (*Puccinia graminis*) [35, p. 351] was the worst for ten years. Wheat head blight (*Fusarium graminearum*) was recorded for the first time from New South Wales.

A maize crop of the variety Richmond was 100 per cent. infected by *Sphacelotheca reiliana* [cf. 35, p. 352]. Red rot (*Physalospora* [*Glomerella*] *tucumanensis*) [35, p. 877] was responsible for estimated losses of 217 tons of sugar-cane, and those caused by sugar-cane mosaic virus [loc. cit.] and Fiji disease virus [36, pp. 177, 455] were 184 and 15 tons, respectively.

New records were a species of *Tilletia* near to *T. pallida* on *Agrostis* and *Tilletia* sp. on snow grass (*Poa* sp.).

The new virus disease of subterranean clover is spread throughout the southern part of the State [36, p. 248].

Burn, caused by *Sphaerulina trifolii* [36, p. 103], was newly recorded on subterranean and white clovers. White and red clovers were severely attacked by rot (*Sclerotinia* sp.) [loc. cit.] which spread to *Lolium perenne* in contact with the rotted clover. *Stagonospora recedens* leaf spot was newly recorded on red clover and caused a considerable reduction in yield. [Datura] rugose leaf curl virus was also recorded for the first time on red clover. Two new diseases of safflower were stem rots caused by *Sclerotinia sclerotiorum* and *Macrophomina phaseoli*.

Owing to the very heavy rains and flooding heavy losses from *Phytophthora citrophthora* [36, p. 456] were suffered in young citrus plantings in the Hawkesbury valley. Melanose (*Diaporthe citri*) [35, p. 3] was widespread in all coastal districts. Symptoms resembling those of citrus xyloporosis virus were observed on Washington Navel oranges on sweet lime stocks in a trial. Severe copper deficiency occurred in orange orchards at Yarramundi and Paterson, and for the first time in the western part of the State at Jerilderie.

An epiphytotic of brown rot (*Sclerotinia fructicola*) [36, pp. 456, 475] on peach for the second year running in the Murrumbidgee Irrigation Areas caused losses amounting to 25 per cent. of the estimated crop.

In the winter of 1956 many banana plants developed a rot of the heart leaf, associated with *Fusarium moniliforme* [*Gibberella fujikuroi*] var. *subglutinans* [cf.

34, p. 517] and several bacteria, apparently active in advance of the fungus [cf. 21, p. 241].

Among new records of diseases on ornamental plants were *Xanthomonas begoniae* on *Begonia*, *Sclerotinia sclerotiorum* on *Myoporum montanum*, *Phytophthora* sp. on *Felicia angustifolia*, *Pythium splendens* on *Pelargonium*, and cucumber mosaic virus on *Polyanthus*.

New diseases of vegetables included *Cercosporella brassicae* [see next abstract] on Chinese cabbage and cauliflower whiptail (molybdenum deficiency) in the Murrumbidgee Irrigation Area.

The main Tableland potato crop was badly affected by *Phytophthora infestans* [23, p. 251] for the first time since 1950–51.

Other new disease records were *Botrytis byssoidea* on onion, *Plasmodiophora brassicae* [36, p. 456] and *Sclerotinia sclerotiorum* on wallflower, *Sclerotium rolfsii* on rough lemon, broad bean wilt virus causing shoot blight on *Dianthus plumarius* and poppy, *Amphichaeta grevilleae* on *Grevillea robusta*, *Pseudomonas erodii* on *Pelargonium*, *Erysiphe graminis* on *Phalaris canariensis*, plum line pattern virus on plum (an old record), pear ringworm (?) virus on Packham's Triumph pear, and *Cercospora richardiicola* leaf spot on arum lily (*Zantedeschia aethiopica*).

New plant diseases.—*Agric. Gaz. N.S.W.*, 68, 1, pp. 41–43, 1957.

New disease records for New South Wales during the six months ended 30th June, 1956 [cf. 35, p. 661; 36, p. 177, and preceding abstract] included *Cercosporella brassicae* [map 197] on wild turnip and Brussels sprouts; *Phoma lingam* [map 73: 35, p. 3] on Brussels sprouts; tomato big bud virus on *Cosmos bipinnatus*, *Gaillardia aristata*, and red clover; *Corticium* [*Sclerotium*] *rolfsii* on rock melon; apple mosaic, flat limb, and thumb mark viruses on apple; *Stereum purpureum* [map 30: cf. 35, p. 357] on apricot and peach; peach rosette mosaic virus on peach [35, p. 335] and nectarine; and ? peach western X virus and *Leptothyrium pomi* on peach.

Grasso (V.). **La ricerca scientifica in alcuni istituti di patologia vegetale degli Stati Uniti d'America.** [Scientific research in some plant pathological institutes in the United States.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 14 (*1956*), 1, pp. 33–66, 1957. [English summary.]

After a stay of some 20 months in the United States, the author presents an interesting account of the plant pathological research work carried out at a number of centres visited by him, especially the Institutes of Plant Pathology at the University of Minnesota and at Pullman, Washington. Most of the work described deals with cereal diseases, the deterioration of grain in storage, virus diseases of fruit trees, and cereal genetics. A bibliography of 70 titles is appended.

Gobelez (M.). **Orta Anadolunun Bazı İllerinde Yetiştirilen Kültür Bitkilerinde, Tohumla Geçen Bakteri ve mantarı Hastalıkların Türleri, Yayılış Alanları ve Bunların Takribi Zarar Derecelerinin Tesbiti Üzerinde Araştimalar.** [Research work on the varieties and areas of spread of bacterial and parasitic diseases affecting and contaminating the seeds of cultivated plants grown in certain provinces of Central Anatolia as well as the approximate degree of damage caused by such diseases.]—*Zir. Fak. Yayinl.*, 107, 62, 131 pp., 43 figs., 1956. [French summary.]

In studies carried out in 1954 and 1955 the author detected approximately 50 seed-borne diseases of cultivated plants in Central Turkey [cf. 27, p. 349], of which the following may be noted: *Ustilago nigra* [29, p. 410], *Helminthosporium gramineum*, *H.* [*Pyrenophora*] *teres*, and *H. sativum* [*Cochliobolus sativus*] on barley; *Mycosphaerella rabiei* on *Cicer arietinum*; *Peronospora spinaciae* [*P. effusa*] on

spinach; and *Pleospora papaveracea* and *Peronospora arborescens* on opium poppy (*Papaver somniferum*), the latter being a new record for Turkey.

Other new records for Turkey were *Tuburcinia* [*Urocystis*] *occulta* on rye; *Phoma lingam* [map 73; cf. 33, p. 449] on cabbage and mustard; ? *Puccinia carthami* on safflower; *Septoria apii-graveolentis* on celery; *Alternaria brassicicola* on cabbage; and *Stemphylium consortiale* on celery and chilli (*Capsicum annuum*).

Zscheile (F. P.). **Some physiological aspects of bunt resistance in Wheat.**—*Plant Physiol.*, 30, 5, pp. 432–437, 1955. [Received 1956.]

At the University of California, Davis, temperature, light quality and intensity, and light period in relation to bunt (*Tilletia caries*) expression in wheat [35, p. 7] were studied in a series of experiments.

The results indicated that a 20-hour daily period of white incandescent light continued throughout the growth of the plants in the greenhouse was too long for maximum bunt expression (100 per cent.) in the susceptible variety Bunyip and was a borderline condition for maximum difference between susceptible Baart and resistant Baart 38. Baart plants from inoculated seed kept in the greenhouse throughout, or transplanted to the field a week or so after emergence were 100 and 97 per cent. bunted, respectively, but Baart 38 was healthy; Baart plants kept after emergence at 10°–13° C. under blue incandescent lamps for 13 days before transfer to greenhouse or field were again fully infected; Baart 38 was healthy in the field, but had 17 per cent. bunt in the greenhouse.

A long, cold period (10° to 13° for 50 days) under incandescent lights for 20 hours daily after emergence, followed by a short, warm greenhouse period, produced 96 per cent. bunt in Baart and 24 per cent. in Baart 38, while 17 days' cold followed by a long, warm period produced maximum bunt in Baart and none in Baart 38.

Tillers produced late in the life span of susceptible varieties may be heavily bunted, especially if given an additional cold treatment after decapitation of the original stem. The duration of the cold period is highly important in determining the extent of bunt expression and the differences between resistant and susceptible varieties; relative light intensities at different periods after emergence may also be of importance.

Klein (Deana T.) & Klein (R. M.). **Quantitative aspects of transformation of virulence in Agrobacterium tumefaciens.**—*J. Bact.*, 72, 3, pp. 308–313, 2 graphs, 1956.

In earlier, qualitative studies [35, p. 710] it was shown possible to transmit the property of host-specific virulence to avirulent strains of *Agrobacterium tumefaciens* by exposing them to products obtained from virulent cultures of the bacterium. A recently developed method for the quantitative assay of crown gall tumours [35, p. 167] has been used at the Department of Zoology, Columbia University, and the New York Botanical Garden to investigate more closely this transformation of virulence.

A number of (recipient) strains were used, ranging from highly virulent to avirulent, and the 'transforming principle' to which they were exposed was filter-sterilized culture fluid from shake cultures (in McIntire's medium) of the various donor strains. Then 5-ml. lots of the principle were incorporated in 5-ml. lots of synthetic medium, which were then inoculated from an 18-hour culture of the recipient strain. After incubation 5-ml. samples of the resulting cultures were assayed for virulence, using standardized 'strong reactor' carrot discs [loc. cit.].

From the results it was concluded that deoxyribonucleic acid was the active constituent. Transmission of virulence occurred only with certain donor-recipient combinations. Virulence thus acquired increased to a maximum with successive periods of active growth and could be further boosted by additional exposure to the

'transforming principle'. Acquisition of virulence was host or host-range specific. It is suggested that virulence may be controlled by multiple loci regulating the synthesis of a tumour-inducing principle effective in plants of a given host range.

Avakyan (S. A.). О новых растениях-хозяевах **Bacillus mesentericus.** [New host-plants for *Bacillus mesentericus*.]—Изв. Акад. Наук Армянск. ССР [*Bull. Acad. Sci. Armen. S.S.R.*], 9, 7, pp. 61–68, 1956. [Armenian summary. Abs. in *Referat. Zh. Biol.* 6, pp. 197–198, 1957.]

The following are stated to be new host records for *Bacillus mesentericus* in the Armenian S.S.R. [cf. 35, p. 602]: walnut, pear, quince, vine, and watermelon. Disease symptoms, pure culture properties, and the results of inoculations are described. Isolates of the bacterium from browning of apricots and eggplants possess a higher degree of adaptability to the host plant than those from quince, vine, and watermelon.

Esau (Katherine). **Phloem degeneration in Gramineae affected by the Barley yellow-dwarf virus.**—*Amer. J. Bot.*, 44, 3, pp. 245–251, 15 figs., 1957.

From the Department of Botany, University of California, Davis, is reported an anatomical study [cf. 28, p. 438] of the development of disease in several cereals and grasses inoculated with barley yellow dwarf virus [33, p. 74; 36, p. 520]. A degeneration resulting in necrosis affected the sieve elements, companion cells, and neighbouring parenchyma. For a given vascular bundle in the leaf or vascular cylinder in the root the process always began in the newly matured first sieve elements, leading the author to conclude that the virus is transported in the phloem, and probably specifically by the sieve elements.

Turner (Dorothy M.). **Studies on cereal mildew in Britain.**—*Trans. Brit. mycol. Soc.*, 39, 4, pp. 495–506, 1 pl., 3 graphs, 1956.

The sources of infection of wheat, oats, and barley in Britain by *Erysiphe graminis* [36, p. 396 and next abstract] were investigated at Leeds University during 1947–50. Cleistocarps of the fungus remain sterile after overwintering, therefore ascospores play no part in spring infection. Examination of spore traps exposed daily at Rothamsted [35, p. 430] showed that shedding of conidia reaches a peak in June, falls in July, and rises again somewhat in October. Ascospores appear first in July and are at a maximum from the middle of this month to the end of August, continuing into late September. They come mostly from the basal sheaths and leaf blades, where moister conditions occur, so that the stubbles are the main source. Only cleistocarps formed on senescent tissue and of a suitable age reach the 'ripe-to-spore' condition and produce the asci, rich in oil drops, which are potential sources of viable ascospores. Short alternating wet and dry periods do not inhibit ascospore differentiation, but once begun it is sensitive to drying out and the air-locks formed in the cleistocarp mat tend to keep out moisture [cf. 36, p. 394]. In warm, dry years the 'ripe-to-spore' stage is attained by a high proportion of cleistocarps, and a long wet period during and after harvest results in a heavy ascospore shower; if sporulation is restricted by a dry, early harvest a secondary shower may occur in September, following the autumn dews.

Ascospore infection of volunteer plants and thence of autumn-sown wheat and barley crops is of major significance. In oats, however, many spring varieties of which are semi-perennial and produce infected, late tillers, the conidial stage is prolonged and cleistocarp formation reduced [cf. 22, p. 165]. As the date of sowing in the autumn is delayed, so infection in all three crops tends to be less. Mycelial growth and sporulation continue in winter except in severe frost [cf. 21, p. 191]; conidia can germinate at 0·5° C. and germ tubes elongate above 3°; despite this, infection does not increase much during winter, that in sowings of November or

later being generally confined to the first leaf. In a hard winter grazing by rodents may reduce sources of spring infection. Clover ley stubbles, however, which maintain a high humidity, provide both effective sources of autumn infection and important centres for early spring infection; autumn grazing of clover leys can therefore afford a measure of control.

Last (F. T.). **The effect of date of sowing on the incidence of powdery mildew on spring-sown cereals.**—*Ann. appl. Biol.*, 45, 1, pp. 1–10, 4 graphs, 1957.

In field experiments at Rothamsted Experimental Station a postponement of the sowing of barley (variety Plumage Archer) in 1953 and of wheat (Atle) in 1954 from February to April increased the incidence of powdery mildew (*Erysiphe graminis*) [cf. 35, p. 873, and preceding abstract] from May onwards. Necrotic lesions, which began to appear on barley in the middle of June, formed sooner on early- than on late-sown crops and on the lower than on the upper leaves. The first cleistothecia were observed on barley on 29th June and were abundant on wheat by 20th July.

Infection reduced the yield of barley sown on both 30th March and 28th April, 1955, by 8 cwt. per acre, but the percentage loss was higher in the late-sown crops. The number of ears per m. of row, the weight of 100 ears, and the weight of 1,000 grains were all reduced by the mildew. In practice it would seem that increasing the interval between date of sowing and the time when weather conditions favour the rapid spread of infection is likely to reduce the probability of large crop losses. Early sowing permits the crop to pass through its phase of rapid growth in conditions unfavourable to mildew. Seed rate (1½ to 2½ bush. per acre) did not affect incidence of mildew or its effect on yield.

Powers (H. R.) & Moseman (J. G.). **Pathogenic variability within cleistothecia of Erysiphe graminis.**—*Phytopathology*, 47, 3, pp. 136–138, 1957.

Arising from the increasing prevalence of powdery mildew (*Erysiphe graminis*) of wheat and barley in the eastern United States during the past decade, studies have been made at Beltsville, Maryland [cf. 36, p. 394] on the variability in pathogenicity shown by cultures derived from single ascospores of the fungus. A wide range was found to occur, as determined by reaction on five differential wheat and six barley varieties, three pathogenic types arising in one instance from a single cleistothecium. In all, 14 pathogenic types were identified on barley and seven on wheat. The heterothallism of *E. graminis* and hybridization of strains may be expected to result in the continued appearance of new races in the future.

Schönbrunner (J.). **Starkes Auftreten von Fußkrankheiten bei Wintergetreide als Auswirkung einseitiger Fruchtfolge.** [High incidence of foot rots of winter cereals as a result of unbalanced crop rotation.]—*Pflanzenarzt*, 9, 9, pp. 83–84, 1956.

Severe damage, amounting in some instances to 70 per cent., was caused in Austria in 1956, particularly in the winter wheat areas of Lower Austria and Burgenland, by foot rot (*Cercosporella herpotrichoides*) [15, p. 352]. Varied crop rotation remains the most effective remedy.

Basile (Rita) & Leonori-Ossicini (Agnese). **Razze fisiologiche di Puccinia rubigo-vera tritici (Erikss. et Henn.) Carl. (=P. triticina Erikss.) in Italia, nel 1953–1954.** [Physiologic races of *Puccinia rubigo-vera tritici* (Erikss. et Henn.) Carl. (= *P. triticina* Erikss.) in Italy in 1953–1954.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 14 (*1956*), 1, pp. 13–19, 1957. [English summary.]

In further work at the Plant Pathology Station, Rome, and the National Institute of Genetics for Cereal Cultivation, Rome [cf. 35, p. 431], the authors identified 11 physiologic races of *Puccinia triticina* in Italy, viz., a new race 163, races 1, 53, 107, 124, and 127 which were new records for the country, and races 56, 58,

61, 98, and 153; none was very virulent. Race 98 was identified nine times on material from eight different localities and is evidently present throughout Italy.

Rosa (M.). **Rinvenimento di un fungo iperparassita su uredosori di Puccinia graminis tritici Erikss. et Henn.** [The discovery of a hyperparasitic fungus on uredosori of *Puccinia graminis tritici* Erikss. & Henn.]—*Boll. Staz. Pat. veg., Roma,* Ser. 3, 14 (*1956*), 1, pp. 129–139, 3 figs., 1957. [English summary.]

Cultures of *Puccinia graminis* on Mentana wheat in the greenhouse at the Plant Pathology Station, Rome, were frequently attacked by a grey mould (*Rhinocladiella atrovirens*) [cf. 18, p. 774] during summer when the temperature in the greenhouse was about 20° C. The fungus appeared only on fully developed uredosori, overgrowing them but not invading the surrounding healthy tissue. The uredosorus was penetrated and together with the spores became disorganized, so that after 10 to 12 days nothing remained but the necrotic spot produced by it on the leaf. The hyperparasite, in culture on various media, formed continuous, ellipsoid conidia slightly pointed at the base and measuring 6 to 6·5 by 2 to 2·5 μ.

Vasil'eva (Mme L. N.) & Azbukina (Mme Z. M.). Желтая ржавчина (**Puccinia glumarum Erikss. & Henn.**) в Приморском крае. [Yellow rust (*Puccinia glumarum* Erikss. & Henn.) in the Maritime region.]—Сообщ. дальневост. Фил. Акад. Наук СССР [*Bull. far-east. Branch Acad. Sci. U.S.S.R.*] 8, pp. 80–82, 1955. [Abs. in *Referat. Zh. Biol.* 6, p. 200, 1957.]

Yellow rust (*Puccinia glumarum*) [cf. 35, p. 437] was widespread in many localities of the far-east maritime region of the U.S.S.R. in 1950 and 1954, both years having been cold and damp. The uredo stage was usually present. The development of the uredospores was observed for the first time in the latter year. The following plants were affected: common wheat, *Triticum compactum, T. turgidum*, barley, *Hordeum distichum, H. hexastichum, H. jubatum, Elymus sibiricus, Roegheria trachycaulon, Agropyron repens*, and spring rye.

S'Jacob (J. C.) & Zadoks (J. C.). **Het overblijven van gele roest in Nederland.** [The survival of yellow rust in the Netherlands.]—Abs. in *Tijdschr. PlZiekt.*, 63, 1, pp. 27–28, 1957.

Light has been thrown on the problem of overseasoning of wheat yellow rust [*Puccinia glumarum*] by the combined results of laboratory tests and field observations in the Netherlands [36, p. 235]. It was shown by a number of sowing-date experiments in 1955 and 1956 that temperatures of 23° C. and upwards arrest the spread of infection only on mature plants, uredospores continuing to develop normally throughout the summer on young ones. In mid-October, 1956, following a cool, damp summer, infection was present on volunteer plants all over the experimental plot. At the close of the month self-sown plants were similarly attacked in Zealand, and by the end of November and early December the phenomenon was general throughout the country. On 12th November J. C. Zadoks noticed two types of 'volunteers' on uncleared plots: large ones, which had presumably sprung from grains shed before the harvest and were therefore already infected then, and smaller plants, arising at harvest, which contracted the disease during September from the older 'volunteers'.

The incubation period of *P. glumarum* was found to be strongly influenced by both day length and temperature. For instance, its duration in inoculation experiments at the end of October was five weeks, increasing to seven in later tests. The first symptoms in the young winter crop of Heine VII and Carsten VI, which did not emerge until 20th October, were detected at the beginning of December. In both 1955 and 1956 even a slight frost damaged the infected leaves, which rapidly decayed on the formation of dew. Spores still incubating in the plant

merely reacted by an extended incubation period (of more than four months in one case during the winter of 1955–6). Latent infection persists, therefore, in externally healthy leaves, and this mode of overwintering accounts for the frequent development of yellow rust in the spring in scattered, small foci resulting from the final attacks of the preceding autumn.

Pilgrim (A. J.) & Futrell (M. C.). **The ascorbic acid content at different stages of growth of stem rust susceptible and resistant Wheats grown under different conditions.**—*Phytopathology*, 47, 4, pp. 193–196, 1 graph, 1957.

Investigations by the United States Department of Agriculture and the Texas Agricultural Experiment Station showed that there was no consistent correlation between ascorbic acid [vitamin C] concentration and resistance to stem rust (*Puccinia graminis*) in wheat. Analyses during autumn 1953 and 1954 showed that the vitamin C content of tetraploid and hexaploid wheats was high at tillering, rose and fell during growth and early flowering, and then decreased to maturity. Limitation of water supply and increase in temperature lessen the amount, which fell notably at the jointing stage in the resistant Kenya Farmer.

Oganesyan (S. G.) & Oganesyan (A. A.). Поражаемость Пшениц грибними заболеваниями в зависимости от питания. [Infection of Wheats by fungus diseases as influenced by nutrition.]—Изв. Акад. Наук Армянск. ССР [*Bull. Acad. Sci. Armen. S.S.R.*], 9, 6, pp. 59–76, 1956. [Armenian summary. Abs. in *Referat. Zh. Biol.* 6, p. 199, 1957.]

Studies in the U.S.S.R. on the effect of a complete fertilizer with and without compost on infection of Artashati 42, Grekum 24, Erythroleucon 1, Evgardi 4, Erythroleucon 2, and Erythrospermum 4 wheats by fungus diseases have shown that the characteristic resistance features are constant. Irrespective of the time of fertilizer application, susceptibility to rust [*Puccinia* spp.] and powdery mildew [*Erysiphe graminis*: 34, p. 471] was increased.

Müller (H. E. H.). **Die Verbreitung von Helminthosporium sativum P., K. und B. in Bayern und seine Bedeutung als Krankheitserreger an Gerste und Weizen.** [The spread of *Helminthosporium sativum* P., K. & B. in Bavaria and its significance as a pathogen of Barley and Wheat.]—*Jb. bayer. Landw.*, 33, 5, pp. 610–640, 3 figs., 3 maps, 3 graphs, 1956.

Examination of seed at the Institut für angewandte Botanik der Technischen Hochschule and the Landesanstalt für Pflanzenbau and Pflanzenschutz, Munich, together with field observations, confirmed that *Helminthosporium sativum* [*Cochliobolus sativus*] is widespread on wheat and barley in Bavaria. That the disease seldom causes large-scale losses is probably explainable in terms of climate and methods of cultivation, as the races found are no less virulent than those in other provinces. From his own observations and a review of the literature the author postulates that where rainfall is high during the vegetative period seed infection is usual whereas in dry regions, such as the prairies of North America, the different mode of cultivation, in particular the absence of rotation, favours infection from the soil [cf. 35, p. 174]. In Bavaria infected seed is usually responsible for the more serious outbreaks and control depends chiefly on the sowing of clean or treated seed, though crop rotation is of importance.

In barley the extent of seed infection varies with the proportion of the total cereal acreage occupied by barley, the weather, particularly in July, and the resistance of individual varieties. The fungus was found to penetrate the seedling root or shoot and spread unhindered in the parenchyma. Hado-Streng, Donaria, and all winter barley varieties exhibited good resistance but practically none was found in the wheat varieties examined.

Noble (Mary) & Montgomerie (Isabel G.). **Griphosphaeria nivalis (Schaffnit) Müller & von Arx and Leptosphaeria avenaria Weber on Oats.**—*Trans. Brit. mycol. Soc.*, 39, 4, pp. 449–459, 1 pl., 1956.

Oat seed surveys were made by the Department of Agriculture, Scotland, during 1951–3 particularly in relation to the diseases caused by *Griphosphaeria* [*Calonectria*] *nivalis* and *Leptosphaeria avenaria* [35, p. 520] in the country; references are made to their occurrence elsewhere. Most of the samples examined had at least 10 per cent. infection by *Fusarium* spp.; *C. nivalis* was common, *F. culmorum* and *F. avenaceum* fairly frequent, but *Gibberella zeae*, common in Ireland [34, p. 573], was not encountered. *C. nivalis* affects spring-sown oats, and perithecia begin to appear in May. Seed infection was determined by plating seed, surface sterilized by 5 per cent. chloros, on agar, by incubation in a damp environment, when infection was evident from a brown discoloration of the roots, and by germinating seed under a layer of moist vermiculite, in which infected coleoptiles are discoloured and severely diseased seedlings fail to emerge. A good seed bed and the use of organo-mercurial seed dusts are recommended to control the disease.

L. avenaria first becomes evident in the field in early July as a purple-brown leaf spot with an orange margin, but at an earlier stage black, necrotic streaks may be observed on the coleoptile base of seedlings. Pycnidia appear subsequently on the stem internodes. By late July or August micropycnidia occur in withered basal leaves [cf. 36, p. 464]. Seed borne infection has been demonstrated in Scotland by the use of vermiculite, lesions appearing on infected coleoptiles. Artificial inoculation of seed gave positive results, as did also inoculation of flowers by spraying with macroconidia.

Rosen (H. R.), Wiser (W. J.), & York (J. O.). **Arkwin, a disease-resistant Oat and comparisons of small grains as winter forage.**—*Bull. Ark. agric. Exp. Sta.* 533, 31 pp., 8 figs., 1953. [Received 1957.]

The oat variety Arkwin [32, p. 309] possesses considerable resistance to most of the more important diseases common in Arkansas. It is resistant to race 1 and, to some extent, to 45 (but not to race 101) of crown rust [*Puccinia coronata*: 36, p. 396], partially resistant to race 7 (but not to 6 or 8) of stem rust [*P. graminis*], resistant to all prevalent races of loose and covered smut [*Ustilago avenae* and *U. kolleri*], highly resistant to *Helminthosporium victoriae* [36, p. 240] and possibly somewhat to *Pyrenophora avenae*, and highly resistant to various virus diseases including [barley] yellow dwarf [36, p. 395] and red spot mosaic [27, p. 360].

Grasso (V.). **Un metodo per la conservazione delle colture dei carboni dell'Avena.** [A method of preserving cultures of Oat smuts.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 14 (*1956*), 1, pp. 67–70, 1957. [French, English, and German summaries.]

Cultures of monosporidial lines of *Ustilago avenae* and *U. levis* [*U. kolleri*] sent from Minnesota to Italy in screw-topped glass phials of about 100 ml. capacity and two-thirds filled with potato dextrose agar were found to have remained viable and retained their pathogenicity after 36 months' storage at laboratory temperature.

Becker (J. G. F.). **De levenscyclus van Septoria nodorum Berk., de verwekker van 'kafjesbruin' op Tarwe.** [The life-cycle of *Septoria nodorum* Berk., the agent of 'glume blotch' on Wheat.]—Abs. in *Tijdschr. PlZiekt.*, 63, 1, p. 21, 1957.

Information is presented on the life-cycle of *Septoria nodorum* and the symptoms it induces on wheat in the Netherlands [28, p. 619], where other grasses affected include rye, *Poa pratensis*, *P. annua*, and *Agropyron repens*.

Ludwig (J. W.), Bunting (E. S.), & Harper (J. L.). **The influence of environment on seed and seedling mortality. III. The influence of aspect on Maize germination.**—*J. Ecol.*, 45, 1, pp. 205–224, 7 graphs, 26 diags., 1957.

In this third series of experiments at the Department of Agriculture, Oxford [cf. 34, p. 593], four varieties of maize were sown on soil pyramids with slopes of 22·5°, 11·25°, and 6·25° facing different ways. Emergence was more rapid on south- than on north-facing slopes, and on west-facing slopes than on horizontal ground, while on the east- it was intermediate between horizontal and north. Variance due to aspect was positively correlated with increasing slope, and differed markedly with sowing date, especially early in the season. There was close correlation between soil temperature and the time taken for 50 per cent. emergence, which was correlated inversely with ultimate emergence.

Baanbreker, followed by Goudster, gave the highest emergence at all sowing dates. Emergence of Wisconsin 240 (from both dent and flint parents) was good from early sowing, but White Horsetooth was slow and unsatisfactory.

Nelson (R. R.). **Heterothallism in Helminthosporium maydis.**—*Phytopathology*, 47, 4, pp. 191–192, 1957.

At the North Carolina State College, Raleigh, 13 isolates of *Cochliobolus heterostrophus* [36, p. 398] from Virginia, North Carolina, and Georgia (five of these from one locality) were mated in all possible pairs. The fungus proved to be heterothallic; mature perithecia were best obtained on pieces of sterile maize leaf on maize meal or Sach's agar when monoconidial isolates were paired on opposite sides of the leaf, 24° C. being the optimum temperature; ascospores matured in about 25 days. There were two compatibility groups, *A* and *a*, with occasional intersterility. The occurrence of some intragroup fertility indicated that genetic factors other than *A* and *a* govern perithecial formation.

Hooker (A. L.) & LeRoux (P. M.). **Sources of protoplasmic resistance to Puccinia sorghi in Corn.**—*Phytopathology*, 47, 4, pp. 187–191, 1957.

In this further contribution to joint studies at Iowa State College, Ames, and the University of Wisconsin, Madison, on the resistance of maize to *Puccinia sorghi* [36, p. 466] some 300 strains from North and South America, Australia, Ethiopia, Turkey, and South Africa were tested against 56 isolates of *Puccinia sorghi* obtained as uredial collections in the United States or Mexico or as aecidial collections following inoculation of *Oxalis* spp.

The general field resistance of maize in contrast to the much lower resistance of inoculated seedlings suggests two types of resistance, namely, protoplasmic and mature plant [35, p. 292]. Some seedlings of the Peruvian variety Cuzco proved resistant to all isolates of *P. sorghi* and the inbred lines B 38, GG 208R, and K 148 were susceptible to only a few; L 317 succumbed to all isolates. Judging by hybrid reaction, resistance appears to be due to dominant factors in 34 strains and to recessive factors in 10. Mexican maize appears to be the best source of rust resistance.

Hooker (A. L.). **Factors affecting the spread of Diplodia zeae in inoculated Corn stalks.**—*Phytopathology*, 47, 4, pp. 196–199, 1 fig., 1957.

Investigations at Iowa State College, Ames, to improve the inoculation technique used for assessing the resistance of maize to stalk rot induced by *Diplodia zeae* [17, p. 811; 36, p. 184] showed that inoculation at any time during the first to fourth weeks after anthesis resulted in the same pattern of disease development, which was most rapid in susceptible varieties (Ia 153 and Os 420) in the first two weeks after infection. The site of inoculation was important, the higher the internode used the greater the spread. To evaluate resistance test plants should be

inoculated in the first or second elongated internode above ground one to three weeks after anthesis and the effects recorded some three to four weeks after inoculation. Resistant lines (B 14 most resistant, WF 9 and L 317 intermediate) are those resistant to attack near the base of the plant; they may be susceptible to *D. zeae* higher up, but in nature this seldom occurs.

KLOTZ (L. J.). **Controlling diseases of Citrus and subtropicals.**—*Calif. Citrogr.*, 42, 6, pp. 220–222, 1957.

Together with some general notes on the preparation of fungicides this contribution contains a useful table of bacterial and fungus diseases and physiological disorders of citrus, against which sprays are applied in California. Also tabulated are the fungicide formulations, time of application, coverage per tree, and crops involved, including date palm and Fuerte avocado pear.

Controlling Botrytis.—*Calif. Citrogr.*, 42, 6, p. 216, 1957.

Grey mould or *Botrytis* blossom blight disease of citrus (*B. cinerea*) [34, p. 782] is widespread and destructive in the coastal areas of southern California, particularly on lemon [34, p. 718]. Control is difficult as the copious inoculum on orchard debris reduces the period of efficacy of a spray to some two weeks, and spraying is economic only when fruit set is threatened by severe outbreaks. Control can be obtained with dithane Z–78 or parzate powder at 2 lb. to 100 gals. water, or a tank-mix of ¾ gal. dithane D–14, 9 oz. each of ferric and zinc sulphates, and 2 oz. triton B–1956 to 100 gals., applied at a pressure of 400 to 500 lb. to insure penetration of the flower parts.

BAINES (R. C.). **Results with vapam to control nematodes, fungi.**—*Calif. Citrogr.*, 42, 6, pp. 192, 202, 204, 206–209, 3 figs., 1957.

Tests were conducted from the University of California Citrus Experiment Station, [Riverside], on seven methods of applying vapam for the control of citrus brown rot (*Phytophthora* spp.) [34, p. 781]. On fine sandy loam near Santa Paula a reduction of approximately 56 per cent. in the number of fungi in the top 2 ft. of soil was secured by 300 lb. vapam per acre applied in water by furrows or sprinklers, but *P. syringae* [30, p. 34] was not affected. The *P.* spp. were detected by placing surface sterilized lemons on soil samples saturated with water. At Riverside 300 lb. vapam per acre applied in 8 acre-in. of water over 24 hours killed 65 per cent. of fungi, and 400 lb. 70 per cent., but failed to control *P. citrophthora* [loc. cit.]. In two vapam-treated plots near Vista 13 and 64 per cent. of trees, respectively, were attacked by *P. parasitica* [36, p. 316], as against 100 per cent. infection on untreated soil. In two sandy loam groves near Corona and Rubidoux, however, vapam at 400 lb. per acre, applied in movable metal rings (44 in. diam. by 12 in. high) to give 5 to 6 surface in. of water, controlled *P. parasitica*, and lemon trees grew satisfactorily during the first year. At Rubidoux 40 lemon trees on treated soil remained free from *P.* spp. while ten out of 11 trees on untreated soil became infected by *P. citrophthora* and *P. parasitica*.

The method of application in surface water appears to hold some promise for control of *P.* spp., but it has yet to be seen how long the effects of a treatment endure.

THOMPSON (W. L.), KING (J. R.), & DESZYCK (E. J.). **Progress report on greasy spot and its control.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 98–104, 1 fig., 1957.

Greasy spot disease of citrus [the cause of which does not appear to have been definitely determined: cf. 26, p. 393] has now become of economic importance in every citrus-growing area in Florida. The principal injury is premature leaf fall, and the chief symptom is the presence, mostly on the lower surfaces of the leaves, of raised, yellowish-brown to black spots.

In experiments at the Florida Citrus Experiment Station, Lake Alfred, in 1955, infection on grapefruit was reduced by an application in July or August of a spray containing 0·4 lb. of copper per 100 gals; one (at 0·27) in July and a second (0·16) in August proved still more effective. A July oil-emulsion spray was as effective as one copper spray in central Florida, but was not effective on the east coast. Very effective treatments were oil in July followed in August by 0·27 lb. of copper, or copper in June followed by oil in July. Two applications of captan at 2 lb. or of ziram at 1 lb. per 100 gals. were also effective.

Grimm (G. R.). **Preliminary investigations on dieback of young transplanted Citrus trees.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 31–34, 1957.

Preliminary results of a study of the nature and cause of die-back of transplanted citrus trees, conducted at the Horticultural Crops Research Branch, Orlando, Florida, indicate that the condition may result from injurious transplanting operations. Healthy fibrous roots were demonstrated to be very important for vigorous tree growth and to constitute one of the best defences against die-back. The presence of leaves appeared to reduce die-back, especially in trees planted in the autumn.

Cohen (M.). **Injury and loss of Citrus trees due to tristeza disease in an Orange County grove.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 19–24, 1 graph, 3 diags., 1957.

The tristeza virus disease situation [cf. 36, p. 316] in 60 acres of an 80-acre orange grove in Orange County, Florida, was surveyed by mapping the trees twice a year from July, 1952, to July, 1956, rating them on a scale of 0 (healthy) to 3 (severe decline, 90 per cent. of the infected ones having tristeza), X (dead or missing), and R (replants). There were 4,169 trees, of which 88 per cent. were Temple orange and 297 Valencias, both on sour orange rootstock, mainly 26 to 30 years old, about 200 [? Valencia] trees on grapefruit stock, and a few on an undetermined stock. The most severely affected trees were in some of the older areas planted with Temple, but the eastern part was not as badly affected as the middle. Valencias, which were also infected with psorosis virus, were less severely injured than the Temples. The planting farthest to the west consisted of Temples about eight years old; relatively few of these or the ones on grapefruit were diseased. The increase in the number of trees in decline from 1952 to 1956 was a steady trend, the total in classes 2, 3, X, and R increasing from 334 at the beginning to 1,126 at the end. It is estimated that, at the same rate, 46 per cent. of the trees will be seriously affected by July, 1960. Of 483 trees in decline in July, 1952, 294 were dead, missing, or replanted by July, 1956, and 396, or 82 per cent., were worse than in 1952.

Of a number of apparently healthy trees indexed on Key lime seedlings, 15 histologically normal were positive for tristeza. Furthermore, four of five trees on grapefruit stock proved to be carriers; there is no indication in Florida that trees on grapefruit stock are injured by the disease. If this sampling is representative, about 75 per cent. of the apparently healthy trees must be carrying the virus. Only one of the trees tested had shown any histological signs of tristeza, though most of them are known to have been infected for nearly two years and some for nearly three.

There is no doubt that tristeza has caused serious losses in Florida. Growers who plant trees on sour orange rootstock, the only intolerant one used in Florida, are risking the life of their planting.

Robertson (J. S.). **Leaf diseases of Oil Palm seedlings.**—*J.W. Afr. Inst. Oil Palm Res.*, [1], 4, pp. 110–122, 8 pl. (4 col.), 1956.

This information on the symptoms, cause, and control of the three types of anthracnose (*Botryodiplodia palmarum*, *Melanconium elaeidis*, and *Glomerella*

cingulata) and freckle (*Cercospora elaeidis*) of seedling oil palms in Nigeria, has already been noticed elsewhere [36, p. 468].

KOVACHICH (W. G.). **Three leaf diseases of young Oil Palms associated with Helminthosporium spp.**—*Trans. Brit. mycol. Soc.*, 40, 1, pp. 90–94, 1 pl., 3 figs., 1957.

On pre-nursery and nursery oil palms in the Belgian Congo eye spot disease (*Helminthosporium carbonum*), first noted in 1954, affects chiefly the 'spear' leaf and next open leaf, the pin-point yellow spots on the lamina subsequently enlarging with a chlorotic 'halo' 5 to 7 mm. in diameter and necrotic centres 0·5 mm. across. The necrosis may be more extensive and spots may coalesce but no spores are produced. Young palms are weakened but the disease is of no importance after six months in the nursery. The fungus causes similar symptoms on a common weed of the nurseries, *Sarcophrynium arnoldianum*. Spores from this host reproduced the disease on oil palms.

Leaf rot, a disease with similar symptoms to eye spot and often accompanying it, is distinguished by more numerous pin-point spots, which become enlarged and dead with a very narrow chlorotic halo. Large areas of the leaf become rotted or chlorotic. Conidia identified as the *Helminthosporium* state of *Cochliobolus heterostrophus* are associated, but could not be cultured for pathogenicity tests. They are also found on *S. arnoldianum*.

Leaf speckle is a minor disease of pre-nursery seedlings, characterized by scattered, brown, pin-point spots, which may coalesce in localized areas to cause rotting, but are not accompanied by chlorosis. The conidia of an unidentified species of *Helminthosporium* isolated from the spots reproduced the spotting but not the rot.

KOVACHICH (W. G.). **Patch yellow disease of the Oil Palm.**—*Trans. Brit. mycol. Soc.*, 39, 4, pp. 427–430, 1 pl., 1 fig., 1956.

Symptoms of the patch yellow disease of oil palm in the Belgian Congo [cf. 26, p. 487; 34, p. 719] range from faint brown speckling on the folded leaflets, the affected patches turning yellow as the leaves unfold, to dark brown rotting followed by desiccation. Severe infection may retard root development, resulting in reduced stem growth and an abnormally erect habit of the leaves. *Fusarium oxysporum* [29, p. 362], isolated from infected leaves, was shown by spray inoculation of the central spears of two- and six-year-old palms to be the causal agent of the disease. As evidence was obtained of varietal susceptibility it is recommended that palms selected for seed production should be tested by inoculation. Maximum susceptibility occurs at 18 months; no palm under a year old contracted infection.

PEREAU-LEROY (P.). **Recherche d'un test de sensibilité des variétés de Palmier-Dattier à la fusariose.** [Search for a test of susceptibility of Date Palm varieties to fusariosis.]—*Fruits d'outre mer*, 12, 2, pp. 53–56, 5 figs., 1957.

Pursuing his studies in southern Algeria and southern Morocco on 'bayoud' disease of date palms caused by *Fusarium oxysporum* [var.] *albedinis* [35, p. 604], the author endeavoured to find an indicator character differentiating the highly resistant Bon Stammi and the highly susceptible Bon Feggous varieties. Attempts to connect susceptibility with chemical composition of roots, trunk, or leaves were unsuccessful. Though root inoculation resulted in the advance of necrosis by only 1 cm. in five months, slow development being a characteristic of the disease, this approach is considered promising.

MUNNECKE (D. E.) & CHANDLER (P. A.). **A leaf spot of Philodendron related to stomatal exudation and to temperature.**—*Phytopathology*, 47, 5, pp. 299–303, 1 fig., 1 graph, 1957.

A leaf spot of *Philodendron* sp. (known commercially as *P.* '*hastatum*'), which is

serious in greenhouses in the Los Angeles area of California and mild in the cooler San Francisco Bay area, is attributable to a secretion from cells below the stomata which contains 28 to 93 per cent. sugar and acts as a medium for the growth of bacteria and sooty moulds. The scattered spots may have necrotic centres. The disease is worst at 75° to 85° F. and spotting increases as soil temperature rises from 60° to 80°. Fungicides do not control it, but zineb or captan checks the growth of the sooty mould. Control requires a compromise between the high temperatures needed for optimum commercial growth and the lower temperatures that lessen the spotting.

Scholten (G.). **Wortelrot bij Cyclamen.** [Root rot of Cyclamen.]—Abs. in *Tijdschr. PlZiekt.*, 63, 1, p. 30, 1957.

Decayed cyclamen corms submitted to the Floricultural Experiment Station, Aalsmeer, the Netherlands, in 1953, consistently yielded *Cylindrocarpon radicicola* [cf. 35, p. 768], which is reported to have destroyed more than half the plants in some nurseries during the year and in 1954. In comparative inoculation experiments with *C. radicicola* and *Thielaviopsis basicola* (also isolated from the same material [cf. 35, p. 813]), only the former (which attacks primarily the large roots near the corm) caused collapse of the plants. *T. basicola* is largely restricted to the finer roots and is therefore of less practical importance than *C. radicicola*, the incidence of which was reduced in both seasons by immersion of the root clumps in solutions of captan or thiram.

Jørstad (I.) & Ramsfjell (T.). **The rust fungus Puccinia hieracii on cultivated Doronicum orientale in Scandinavia.**—*Nytt Mag. Bot.*, 5, pp. 33–35, 1957.

A rust fungus corresponding to the 'small species' *Puccinia doronicella* within the limits of *P. hieracii* [cf. 29, p. 279] has been observed on cultivated *Doronicum orientale* in Sweden and Norway. Uredospores vary from 27 to 32 by 24 to 27 μ to 29 to 33 by 22 to 27 μ, and teleutospores from 26 to 39 by 16 to 25 μ to 27 to 37 by 16 to 24 μ. This constitutes a new host record for Scandinavia. Other rusts on *Doronicum* are discussed.

Morgan (O. D.). **Mimosa wilt spreading in southern Maryland.**—*Plant Dis. Reptr*, 41, 1, pp. 51–52, 4 figs., 1957.

Fusarium wilt (*F. oxysporum* f. *perniciosum*) [32, p. 597; 36, p. 436] has recently been destructive on mimosa (*Albizzia julibrissin*) in Maryland, where apparently no resistant varieties [loc. cit.] are grown.

Lyalina (Mme A. S.). Грибной 'ожог' Роз. [Fungus 'burn' of Roses.]—Бюлл. чл. бот. Сад. Акад. Наук СССР. [*Bull. cent. bot. Gdn. Acad. Sci. U.S.S.R.*], 1956, 24, pp. 95–96, 1956. [Abs. in *Referat. Zh. Biol.* 6, p. 207, 1957.]

Coniothyrium fuckelii [*Leptosphaeria coniothyrium*: cf. 34, p. 368] and *C. wernsdorffiae* [map 319] are reported from the Central Botanical Garden, [? Moscow], U.S.S.R., to be causing burn of the bark, shoots, and woody parts of roses. The disease is stated to be quite serious.

McClellan (W. D.), Taylor (E. A.), & Smith (F. F.). **Synergism between copper and sulfur in dust mixtures for the control of Rose blackspot.**—*Phytopathology*, 47, 4, pp. 240–241, 1957.

Investigating the control of black spot of roses (*Diplocarpon rosae*) [36, p. 322] on five varieties at Beltsville in 1954–5, the authors found a synergistic interaction between copper and sulphur [cf. 23, p. 264] in controlling the fungus [24, p. 103]. The dusts, applied at 35 lb. per acre weekly for 18 weeks, contained 5 per cent. DDT, 1 per cent. lindane, and a miticide (1·5 per cent. aramite), with added 3·4 per cent. copper (Tennessee copper 34) and 25 per cent. sulphur (325-mesh dusting

sulphur) alone or together. All plants were inoculated uniformly with a spore suspension in July. Neither copper nor sulphur was much use alone, but together they reduced black spot and increased flower yields markedly, as shown in the tabulated results for two varieties. No synergistic effect was observed with ferbam and sulphur.

Rozsypal (J.) & Mráz (F.). **Bakteriosy Máku setého pozorované v Československu.** [Bacteriosis of Poppy observed in Czechoslovakia.]—*Čsl. Biol.*, 5, 4, pp. 218–226, 1956. [Abs. in *Referat. Zh. Biol.* 6, pp. 207–208, 1957.]

Leaf spot (*Xanthomonas papavericola*) [cf. 32, p. 626] and stem bacteriosis (*Bacterium carotovorum*) [*Erwinia carotovora*] are widespread on cultivated and wild poppies [*Papaver* spp.] in Czechoslovakia and are transmitted by [unspecified] insects. Both diseases are described in detail. Control involves careful seed selection, good husbandry, selection of not too damp a field, and insecticide application.

Fergus (C. D.). **Cylindrosporium leafspot of Spiraea.**—*Mycologia*, 49, 2, pp. 262–268, 2 figs., 1957.

A leaf spot of *Spiraea vanhouttei* in a nursery near Ottawa, Kansas, was caused by *Cylindrosporium filipendulae*. Pale yellow lesions appear on the leaves, those on the upper surface becoming dark brown, irregular, and slightly larger than those on the lower, which are orange-brown and irregular to circular. The spots are usually 1 to 2 mm. in diameter, but may coalesce, large areas of the leaf or the entire leaf being killed. On the lower surface of the leaves large yellow masses of conidia are extruded from acervuli, rupturing the epidermis. An examination of herbarium material showed that the host range includes 12 other *S.* spp.

Schmidt (Trude). **Eine pilzliche Blattfleckenkrankheit der Schwertlilien.** [A fungus leaf spot disease of Irises.]—*Pflanzenarzt*, 9, 8, p. 78, 1 fig., 1956.

Fungus diseases of iris are extremely rare in Austria but *Heterosporium gracile* [*Mycosphaerella macrospora*: cf. 33, p. 322] was widespread in 1955. Control is by preventive treatment with copper, sulphur, or thiocarbamate preparations.

Magie (R. O.). **Gladiolus Botrytis control.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 337–343, 1957.

Some of this information from the Gulf Coast Experiment Station, Bradenton, Florida, on the control of grey mould (*Botrytis gladiolorum*) of gladiolus since 1947 has already been noticed [29, p. 88; 35, p. 512]. The disease is at a peak in February and March and is particularly severe in cut-over, unsprayed fields. In 1951 plots of Picardy gladioli were sprayed twice weekly from 3rd to 29th January; the partly opened petals were inoculated on 22nd January, eight hours after spraying. The numbers of spots on 29th January, expressed as percentages of the control, were, for dithane D–14 plus zinc sulphate (2 qts. plus $\frac{3}{4}$ lb. per 100 gals.) 1·3 on the petals and 0·2 on the leaves, the corresponding figures for parzate (2 lb.) being 1·7 and 0·7, and for vancide 51 (3 pints)+1 lb. zinc sulphate 5·8 and 3·1. Dithane and parzate caused severe injury to the open flowers, though vancide 51 was non-injurious. In 1954 sprays for the control of leaf spot were applied twice weekly from 16th February to 22nd April; following manzate (2–100) there were 349 leaf spots on plants grown from cormels and planting stock taken together, the corresponding figures for parzate (2–100), these two treatments alternately, and the untreated being 472, 250, and 10,354.

The control methods detailed include spraying with zineb 2–100 or dusting with zineb (6 per cent. active) at weekly intervals, as soon as the temperature falls to 40° F. Once the disease has appeared spraying should be carried out twice weekly with maneb and zineb alternately. If the weather is unsuitable for spraying or

dusting, the spike heads should be dipped for five seconds on arrival at the packing-house in puratized agricultural spray, vancide 51, or nabam plus zinc sulphate, a spreader being used in each.

McClellan (W. D.) & Pryor (R. L.). **Susceptibility of Gladiolus varieties to Fusarium, Botrytis, and Curvularia.**—*Plant Dis. Reptr*, 41, 1, pp. 47–50, 1957.

At Beltsville, Maryland, in 1955, 140 varieties of *Gladiolus* were tested by inoculation for resistance to *Fusarium oxysporum* f. *gladioli* [35, p. 368]. In 1956 some of these and others were tested against the same pathogen and against *Botrytis gladiolorum* [see preceding abstract] and *Curvularia trifolii* [35, p. 792; cf. 36, p. 187].

Resistance to these three diseases is not controlled by the same genes. Kerry Dancer was highly susceptible and Sierra Snow moderately so to both *B. gladiolorum* and *C. trifolii*, while Catherine Beach was moderately susceptible to the former and highly susceptible to the latter; all three varieties were resistant to *F.o.* f. *gladioli*.

Hood (J. R.) & Stewart (R. N.). **Factors affecting symptom expression in Fusarium wilt of Dianthus.**—*Phytopathology*, 47, 3, pp. 173–178, 1 fig., 2 graphs, 1957.

Investigations were carried out at Beltsville, Maryland, to determine the optimum method of inducing carnation wilt by infection with *Fusarium oxysporum* f. *dianthi* [*F. dianthi*: 22, p. 387; 34, p. 37] to facilitate the selection of resistant varieties. Inoculation by dipping the roots in an inoculum containing approximately 1,500 fungus bodies (spores or broken hyphae) per ml., or by inserting pieces of agar culture into stem wounds were found the most suitable of a number of methods essayed. There appeared to be no significant cross infection between 2-in. pots in contact. A soil temperature of 26° C. and air temperature between 21° and 26° were optimum for infection, symptom expression being increasingly early as the temperature rose above 15°, and more so in sterilized than in unsterilized soil. Using 11 commercial varieties of carnation and three isolates from a number of cultures of different geographic origin the existence of three pathogenic races of *F. dianthi* was established; it would seem therefore that the number of such races may be considerable.

Bakker (M[artha]). **Bacterieverwelkingsziekten van Anjers.** [Bacterial wilt diseases of Carnations.]—Abs. in *Tijdschr. PlZiekt.*, 63, 1, pp. 20–21, 1957.

Carnation bacterial wilt disease in the Netherlands has been attributed to *Pseudomonas caryophylli* [34, p. 369]. The disease in Denmark [34, p. 524] has now been referred by Hellmers to *Erwinia carotovora* f. sp. *dianthicola* [cf. 35, p. 767; 36, p. 31]. The two pathogens induce different symptoms, stunting being characteristic of the latter, while large, longitudinal cracks in the stem are often found associated with the former. Moreover, *P. caryophylli* grows at a higher temperature than *E. c.* f. sp. *dianthicola*.

The *Erwinia* disease is very destructive, spreading from one plant to another under glass and frequently necessitating the clearance of an entire first-year bed. The lengthy incubation period in cuttings complicates recognition, months sometimes elapsing before the appearance of symptoms. Therefore, despite the vigilant precautions of the plant inspection service, the bacterium might be present in cuttings from apparently healthy plants, and for this reason the importation of cuttings into England from the Netherlands is temporarily prohibited. A laboratory has been installed at Aalsmeer for testing cuttings by the method devised by Hellmers [34, p. 525].

The association of nematodes (*Meloidogyne* sp.) with the disease is suspected on the basis of experimental results.

Quak (Frederika). **Meristeemcultuur, gecombineerd met warmtebehandeling, voor het verkrijgen van virusvrije Anjerplanten.** [Meristem culture combined with heat treatment for the procurement of virus-free Carnation plants.]—*Tjidschr. PlZiekt.*, 63, 1, pp. 13–14, 1957. [English summary.]

No stocks of the important Pink Sim and Harvest Moon carnation varieties free from mosaic virus being available in the Netherlands [32, p. 387] and heat treatment having proved ineffectual for the elimination of infection, the method was combined with meristem culture [cf. 32, p. 191]. Apical meristems with some leaf primordia were isolated from plants held for six to eight weeks at 40° C. and cultured in nutrient agar. When 2 cm. high the new plants were transferred to a light soil mixture. Ten survivors (eight of Pink Sim and two of Harvest Moon), which made normal growth and were demonstrated to be virus-free by serological tests and local-lesion assays, are to be used for the production of virus-free stocks.

Corbett (M. K.). **Virus ring spot of Peperomia obtusifolia and Peperomia obtusifolia var. variegata.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 357–360, 7 figs., 1957.

Plantings of the ornamental *Peperomia obtusifolia* in Florida are sometimes disfigured by concentric ring markings on the leaves, some of which may be markedly cupped, curled, or twisted. On many plants only the older leaves are affected. Severely affected plants may be stunted and many growers have experienced losses of over 25 per cent.

At Florida Agricultural Experiment Station, Gainesville, the disease was transmitted from affected to previously healthy potted plants of *P. obtusifolia* in 30 to 60 days by grafting, thus confirming the findings of Creager (*Flor. Rev.*, 87, 2256, pp. 15–16, 1941) who first described the virus. Secondary grafts made from the diseased stocks again gave typical infection. The disease could not be transmitted by mechanical inoculation to healthy *P. obtusifolia* and various virus indicator plants. Insect transmission was not attempted.

Plants of *P. obtusifolia* var. *variegata*, on which the disease has not been reported, were used as parental material from which to obtain healthy clonal cuttings. These plants were then grafted as in the earlier experiments, and within two weeks the new leaves on the stock exhibited brown, necrotic, concentric rings. Small, brown, necrotic spots appeared on the leaves bearing the rings, and these leaves fell off in a few days. Variegated peperomia leaf tissue was rooted and green peperomia plants were obtained. These plants were grafted with diseased green peperomia scions, and reactions resembling those observed in green peperomia resulted.

All affected plants should be removed and destroyed. To control the disease as rapidly as possible, cuttings from healthy, vigorous plants should be rooted in sterilized or fumigated raised benches and then planted directly into similar benches. These plants would form a disease-free stock for increase.

Lovisolo (O.). **Petunia : nuovo ospite naturale del virus del rachitismo cespuglioso del Pomodoro.** [Petunia, a new natural host of Tomato bushy stunt virus.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 14 (*1956*), 1, pp. 103–119, 3 figs., 1957. [English summary.]

Towards the end of 1954 the leaves of petunias growing in two private gardens in different parts of Piedmont, Italy, developed a mosaic spotting, malformation, and necrotic rings; mosaic was sometimes present on the stems also. Almost all the affected plants were small and bushy and either failed to flower or bore deformed and abnormal flowers, often with mosaic symptoms.

In studies at the Institute of Plant Pathology, Turin, and at the Plant Pathological Station, Rome, the disease was transmitted by sap inoculation from affected petunias to 34 species of plants, representing 28 genera and 11 families. With the

exception of petunia, tomato, and *Datura stramonium*, all reacted with local lesions only. Basil (*Ocimum basilicum*), highly susceptible to the virus, proved especially useful as a test plant, developing numerous, distinct lesions, being immune from infection by tobacco mosaic virus, and reacting to cucumber mosaic virus by mottling. By reason of the symptoms produced on the test plants and its other characteristics, the virus was identified as that of tomato bushy stunt [cf. 35, pp. 493, 580]. In preliminary experiments *Myzus persicae*, with 95 mins. starvation and 45 to 60 mins. feeding, transmitted the virus from chilli pepper and petunia to petunia in three out of 16 experiments.

Hollings (M.). **Anemone mosaic—a virus disease.**—*Ann. appl. Biol.*, 45, 1, pp. 44–61, 1 pl., 1957.

At the Plant Pathology Laboratory, Harpenden, a virus differing from any previously described on anemones was isolated from *Anemone coronaria* plants received from Starcross, Devonshire, in 1953. The name anemone mosaic virus is proposed. The plants were chlorotic and reduced in vigour, with slightly mottled leaves [cf. 35, p. 79]. The flowers were distorted and 'broken', white splashes and flecks being present on red or blue flowers. Necrotic pitting, streaking, and die-back developed along the petioles in the winter and killed most of the plants.

The disease was apparently widespread in the anemone-growing area of the south-west in 1953, but was uncommon in 1954. In 1955, however, serious outbreaks occurred, incidence approaching 100 per cent. in some places and the flowers being of poor quality or unsaleable. In most areas the commonest syndrome was a leaf mottle and distortion, with flower break or malformation, or both; a sharply defined, deep yellow leaf mottle ('aucuba mottle') with slight flower 'breaking' affecting some plants. A third type of syndrome was a curling and rugosity of the leaves [loc. cit.], with poor growth, best described as 'crinkle'; several of these plants contained cucumber mosaic virus.

The virus infected 47 of 90 plant species inoculated; it was transmitted mechanically and by four of six species of aphids tested, though *Myzus persicae* was the only efficient vector. Most aphids ceased to be infective within 30 mins. when continuing to feed after leaving an infected plant. The thermal inactivation point of the virus was below 62° C., the dilution end-point did not exceed 1 in 2,500, and inactivation occurred in under 72 hours at 18°. Intracellular inclusions were present in all hosts examined. The virus is very similar to those of the turnip virus 1 group [turnip mosaic virus] and is serologically related to cabbage black ring spot virus though there was no cross-protection.

The virus was also isolated from cultivated *Ranunculus* sp. (Claremont hybrids) and Brompton stocks (*Matthiola* sp.).

Naturally infected weeds (*Senecio vulgaris* and *Capsella bursa-pastoris*) were found in anemone plantings, and the virus was also detected, with the cucumber mosaic [loc. cit.] and tobacco necrosis viruses, in anemone corms imported from the Netherlands. The latter virus was isolated from apparently healthy plants.

Mitov (N.). Изучение распространения ржавчины Подсолнечника **(Puccinia helianthi Schw.).** [A study of the spread of Sunflower rust (*Puccinia helianthi* Schw.).]—*Nauch. Trud. M-vo Zemedel., Ser. Rastenievodstvo*, 1, 1, pp. 31–50, 1956. [Russian and English summaries. Abs. in *Referat. Zh. Biol.* 6, p. 203, 1957.]

Investigations by the Institute of Plant Protection, Sofia, Bulgaria, from 1952 to 1954 showed that fallen leaves and not seeds were the infection sources of sunflower rust (*Puccinia helianthi*) [10, p. 210]. Growing sunflowers 500 m. away from the previous year's plot and the compulsory ploughing under of the leaves on neighbouring plots are recommended as practical control measures.

Cummins (G. B.). **Host index and morphological characterization of the grass rusts of the world.**—*Plant Dis. Reptr, Suppl.* 237, 52 pp., 1956.

In this alphabetical host index of Uredinales parasitic on grasses, the species, with some facultative synonyms, are listed under each grass genus. In the introduction the author suggests nine groups into which the rusts may be arbitrarily segregated according to the morphology of the uredo stage; this group number is inserted after each species in the list. In tables for each of the nine groups the principal diagnostic characters of each species are set out. By means of the list and the tables it is possible to identify a grass rust.

The author considers the index reasonably complete, though there may be occasional errors in the listing of species, since only certain tribes of grasses, such as Andropogoneae and Chlorideae [36, p. 32], have been studied in detail.

Kuznetsova (Mme R.). Уточнение некоторых вопросов, касающихся специализации желтой ржавчины **(Puccinia glumarum (Schm.) Erikss. et Henn.).** [Elucidating certain problems regarding the specialization of yellow rust (*Puccinia glumarum* (Schm.) Erikss. & Henn.).]—Бот. Журн. [*J. Bot. U.S.S.R.* = *Bot. Zh. S.S.S.R.*], 41, 10, pp. 1439–1445, 2 figs., 1956.

A detailed comparison at the Far-eastern Scientific Research Institute for Agriculture, U.S.S.R., of herbarium specimens of orchard grass (*Dactylis glomerata*) bearing rust, which has been called both *Puccinia dactylidina* (F. Bubák. *Ann. mycol., Berl.*, 3, p. 219, 1905) and *P. glumarum*, showed that there was only one rust species present.

The author confirmed Manner's findings [29, p. 609] that the uredospores on *D. glomerata* are considerably smaller (18·99 by 16·81 μ) than those of *P. glumarum* from wheat (20·52 by 18·62 μ) [see above, p. 580], though the differences in plants inoculated in the greenhouse were not so great.

In fresh spores from wheat the orange pigment is evenly distributed throughout the protoplasm, whereas in those from *D. glomerata* it is confined to the centre. The teleutospores, too, differ in the colour of the wall. The basidiospores from wheat rust are orange-yellow, and those from *D. glomerata* pale brown.

In Kirghiz S.S.R. uredospores of *P. glumarum* first appear on wheat and other cereals at the end of March and teleutospores 80 days later, while on *D. glomerata* the former do not develop until July, when teleutospores appear almost simultaneously. Under experimental conditions (both in Leningrad and Kirghiz S.S.R.) teleutospores were never obtained in wheat whereas there was a mass production on *D. glomerata*. Single wheat teleutospores could be germinated in autumn immediately after formation but those from *D. glomerata* would germinate only in the spring.

Uredospores from wheat and other cereals failed to infect *D. glomerata* [loc. cit.] and those from the latter did not infect wheat or other cereals susceptible to *P. glumarum*.

The author concludes, therefore, that the rust on *D. glomerata* is distinct from *P. glumarum* and takes up the name *P. dactylidina* for it.

Webster (J.). **Succession of fungi on decaying Cocksfoot culms. Part II.**—*J. Ecol.*, 45, 1, pp. 1–30, 1 graph, 14 diags., 1957.

This paper, which completes the author's study of the succession fungi on stems of *Dactylis glomerata* near Sheffield during a two-year period after flowering [cf. 36, p. 190], analyses the more common distribution patterns. Group I includes *Cladosporium herbarum*, *Epicoccum purpurascens*, *Alternaria tenuis*, *Leptosphaeria microscopica*, and *Pleospora vagans*, which are primary saprophytes persisting on the upper internodes until the following year. The spores of these fungi germinate readily and the germ tubes grow quickly. In group II, *Acrothecium* sp. is confined

to the damper tussock base early in the succession and may spread to the upper internodes on fresh cut-down stems. Spore germination occurs only at or near saturation and growth is slow. *Mollisia palustris* and *L. nigrans*, in group III, are confined, probably by humidity demands, to the tussock base during spring and summer in the year following flowering. *Helminthosporium hyalospermum* and *Tetraploa aristata* in group IV persist in the tussock stem and on old fallen stems until the second summer; while *Selenophoma donacis* [loc. cit.] and *Mycosphaerella recucita* fruit on the upper internodes in late summer of the year following flowering.

The decomposition pattern is compared with the succession of fungi on decaying dung, timber, and plant material in the soil.

Graham (J. H.), Sprague (V. G.), & Robinson (R. R.). **Damping-off of Ladino Clover and Lespedeza as affected by soil moisture and temperature.**—*Phytopathology*, 47, 3, pp. 182–185, 1 graph, 1957.

The part played by *Rhizoctonia* [*Corticium*] *solani*, *Pythium debaryanum*, and *Fusarium roseum* (group) in causing pre- and post-emergence damping-off of Ladino clover [cf. 35, p. 300] and *Lespedeza* at three levels of soil moisture (low, medium, and saturated) over a temperature range from 52° to 94° F., tested at 7° intervals, under 'daylight' lamps for 12 hours was investigated at the State College, Pennsylvania. The soil used was sterilized and inoculated with one of the fungi in 4-in. glazed crocks in each of which 50 seeds were sown.

Total emergence of Ladino clover ranged from 64 to 70 per cent. between 52° and 80° (66° and 73° being the most favourable); it fell sharply at higher temperatures; for *Lespedeza* it was from 88 to 91 per cent. up to 87°, the optimum. Moisture level had little effect on these figures. On agar radial growth of *F. roseum* and *C. solani* achieved a maximum *ca.* 80°, and of *P. debaryanum* near 87°. Damping-off, however, could not be correlated with the ratio of velocity of emergence to the growth rate of the pathogen [cf. 27, p. 344].

Pre-emergence damping-off of the clover by all three fungi was favoured by high temperatures, *Lespedeza* suffering more from *Fusarium* and *Pythium* at low temperatures and being little affected by *Corticium*. Post-emergence damping-off of Ladino clover by *Pythium* was worst at intermediate temperatures (66° to 73°), and was generally poor at low temperatures. *Corticium* and *Pythium* killed 85 to 100 per cent. of the *Lespedeza* seedlings at 66° to 87°, but *Fusarium* affected them only at lower temperatures.

In general *Fusarium* was most active in drier soil and of little effect in saturated soil, the clover was most subject to *Corticium* in saturated soil, but moisture had little effect on the damping-off of *Lespedeza*. *Pythium* was more active in wet soil.

Graham (J. H.). **A Stemphylium disease of Ladino white Clover.**—*Phytopathology*, 47, 4, pp. 213–215, 1 fig., 1957.

A more detailed account is given of the leaf disease of Ladino white clover observed in central Pennsylvania since 1953 and shown to be caused by *Stemphylium trifolii* n.sp. [36, p. 408]. The conidia, 27 to 50 by 11 to 21 (average 36·2 by 16·7) μ, have one to four prominent constrictions. The optimum temperature range for mycelial growth was established as 25° to 30° C., for sporulation on the leaves 15° to 19°, for spore germination 20° to 30°, and for disease development around 22°.

Inoculations of forage legumes with other species of *Stemphylium* showed *S. sarciniforme* [34, p. 438] to be able to attack white sweet clover (*Melilotus alba*), red clover, and lucerne, but not *Lotus corniculatus*; *S. botryosum* [*Pleospora herbarum*: 35, p. 21] infected *M. alba* (mildly), red clover, and lucerne, but not Ladino or *L. corniculatus*; *S. loti* [33, p. 356] was pathogenic only on lucerne and *L. corniculatus*; and *S. solani* [35, p. 553] on none of them.

Cole (H.) & Couch (H. B.). **Etiology and epiphytology of northern anthracnose of Red Clover.**—Abs. in *Phytopathology*, 47, 4, p. 244, 1957.

Observations [in Pennsylvania] showed that *Kabatiella caulivora* [35, p. 879] remained viable in infected red clover petioles stored under field conditions for 13 months, and that dried conidia remained viable over eight months on dry slides, seeds, and soil with moisture at field capacity. Exposure of plants sprayed with a spore suspension to a moisture-saturated atmosphere for five hours at 20° to 25° C. induced infection, the petiole epidermis being penetrated within 48 hours and symptoms developing, with sporulation, in eight days. Conidia were readily dislodged by water, but not by wind. Ten other species of *Trifolium*, *Melilotus alba*, and *Medicago sativa* were infected by inoculation.

Smith (J. D.). **Fungi and turf diseases. 6. Ophiobolus patch disease.**—*J. Sports Turf Res. Inst.*, 9, 32, pp. 180–202, 4 pl., 1956.

This part [cf. 35, p. 680] deals with the occurrence of patch disease (*Ophiobolus graminis* and *O.g.* var. *avenae*) [35, p. 611] in Great Britain and elsewhere, symptoms, species of turf affected, rainfall in relation to it, the causal organism, pathogenicity, relation to pH and lime applications, and control.

In sports turf, *O. graminis* was frequently observed by the author to be associated with severe damage to root systems and shoot bases of *Agrostis canina* [cf. 32, p. 435]; runner-hyphae and 'root-browning' lesions were seen on *Poa pratensis*, *Holcus lanatus*, *Festuca rubra*, and *Deschampsia caespitosa* surviving in patches where *Agrostis* spp. had been killed out. In plants of *Anthoxanthum odoratum* and *P. trivialis* from similar situations there was slight root infection with runner-hyphae.

In 11 outbreaks of the disease where ascospore or asci measurements (or both) were made, in ten (all on *Agrostis* spp.) the fungus was *O. g.* var. *avenae*, in the remaining one (on *P. annua*) it was *O. graminis*.

In tube and pot experiments an isolate (var. *avenae*) from *Agrostis tenuis* was pathogenic to nine species of grasses and to oats; *Lolium perenne* (S 23) and *A. tenuis* (N.Z. browntop) were highly susceptible.

Finer grades of lime applied to acid turf of *A. tenuis* (pH 4·5) raised the pH of the topmost inch more than the coarser grades did. The disease appeared on the turf treated with the finer grades, but not on that treated with the coarsest nor on the untreated. Ammonium sulphate and mono-ammonium phosphate checked infection and favoured patch-healing, the latter proving only a little more effective despite the fact that it supplied phosphorus to a turf known to be deficient in this element. An organo-mercury fungicide applied alone checked the disease, but used in combination with the fertilizers conferred no benefit.

Gray (Elizabeth G.) & Nicholson (I. A.). **Snow mould on upland pasture in north Scotland.**—*Trans. bot. Soc. Edinb.*, 37 (*1955–56*), 2, pp. 123–128, 1 pl., 1957.

Snow mould (*Fusarium nivale*) [*Calonectria nivalis*: 35, p. 520] may be found in the north of Scotland on pasture grasses at any season of the year when cool and moist conditions prevail. It was identified in 1955 on dying-out *Agrostis tenuis* [see next abstract], *A. stolonifera*, *Lolium perenne*, and *Poa trivialis* in various localities, two of which were re-seeded areas. Associated grasses, particularly *Festuca rubra* and *Dactylis glomerata*, were not attacked. Evidence seemed to indicate that heavy autumn rainfall followed by a prolonged snow cover may be one of the chief predisposing causes. The disease appears to be an important factor determining the development of semi-natural *Agrostis-Festuca* grassland.

Smith (J. D.). **Turf disease notes, 1956.**—*J. Sports Turf Res. Inst.*, 9, 32, pp. 233–234, 1956.

In these notes on turf diseases in Great Britain in 1956 [cf. 35, p. 679] the author

states that in early July *Fusarium* patch [*Calonectria nivalis*] severely attacked a seedling turf of *Agrostis canina* [see preceding abstract] sown in late May. An adjacent plot of *A. tenuis* was only slightly affected. Heavy outbreaks occurred on mature turf at the end of December, when very mild weather prevailed. Dollar spot (*Sclerotinia homoeocarpa*) [see next abstract] was present during most of the year on bowling-greens. In March foot rot and leaf spot due to *Helminthosporium vagans* [35, p. 680] were severe on mown turf of many strains of *Poa pratensis*. *Colletotrichum graminicola* [cf. 35, p. 635] was found on *P. annua* from a bowling-green in Belfast and on the same species on the experiment ground, St. Ives Research Station, Bingley, Yorkshire, which had received top-dressings of alkaline vermiculite.

Smith (J. D.). **Dollar spot trials, 1956.**—*J. Sports Turf Res. Inst.*, 9, 32, pp. 235–243, 3 pl., 1956.

In plot trials at the Sports Turf Research Institute, Bingley, Yorkshire, a turf of Lancashire sea-marsh fescue [mostly *Festuca rubra* ssp. *rubra*], naturally infected with dollar spot [*Sclerotinia homoeocarpa*: 35, p. 680, and preceding abstract] supplemented by artificial inoculation, was treated on 2nd May, 6th June, and 3rd July, 1956, with a stock solution of cadmium chloride (5 per cent. w/v of cadmium) plus 10 per cent. w/v of urea to prevent scorching. Fertilizer applications were 1 oz. superphosphate and ½ oz. potassium sulphate per plot (22·5 sq. ft.) on 17th April and three levels of ammonium sulphate given in five applications in April, May, June, July, and August. The aim of the trial was to determine the effect of nitrogen on the disease.

On 20th July, 1956, no dollar spot was present in any of the plots treated with cadmium. In the plots without cadmium those given 4 oz. ammonium sulphate per sq. yd. had 40 per cent. infection, the figure for 2 oz. being 57·5 per cent., 1 oz. 62·5 per cent., and none 67·5 per cent.

Smith (J. D.). **Seed dressing trials, 1956.**—*J. Sports Turf Res. Inst.*, 9, 32, pp. 244–250, 1956.

At the Sports Turf Research Institute, Bingley, Yorkshire, in 1956, seed treatment with two fungicides based on thiram (premasan and fernasan), agrosan GN, and spergon highly significantly increased the establishment of New Zealand Chewing's fescue (*Festuca rubra* ssp. *commutata*) sown in drills in soil inoculated with *Fusarium culmorum*. Fernasan at 2 per cent. gave an increase of 57 per cent. over the untreated seed. The best stands with premasan were secured with the 2 and 1 per cent. rates (205 and 203 seedlings per row compared with 141 in the control). Agrosan GN was most efficient (219 against 144) at 0·4 per cent. Griseofulvin (wettable powder) was not very effective, and cereline (non-mercurial organic) at all dosages reduced establishment.

Hardison (J. R.). **Record of blind seed disease control in Oregon.**—*Plant Dis. Reptr.*, 41, 1, pp. 34–41, 3 graphs, 1957.

A control programme started in 1944 has progressively reduced the incidence of blind seed disease (*Gloeotinia temulenta*) in crops of perennial rye grass (*Lolium perenne*) grown for seed in Oregon [29, p. 101; 33, p. 759], and since 1950 losses have been negligible. Following the 1949 harvest, the programme was greatly improved by the adoption of post-harvest burning of all slightly infested fields. Among other recommended control measures are the sowing only of disease-free or 24-month-old seed; ploughing in autumn or early spring of all severely infested fields and any fields which have produced three seed crops; and burning of all diseased rye grass screenings.

Alekseeva (Mme O. S.). Про одне захворювання Гречки. [A virus disease of Buckwheat.]—Микробиол. Журн. [*J. Microbiol., Kiev*], 18, 2, pp. 19–22, 1956. [Russian summary. Abs. in *Referat. Zh. Biol.* 6, p. 201, 1957.]

A buckwheat disease in U.S.S.R., not previously described in the literature and believed to be of virus origin, is noted. It is tentatively called mosaic and is most severe on vigorous varieties. Experiments with sowing dates showed that the latest (20th and 30th June) resulted in highest infection percentages; the earliest (30th April and 10th May) were free from infection; and the intermediate had slight to medium infection percentages. This is explained to be due to the higher susceptibility of plants in the young stages at high air humidity and temperatures below 20° [C.].

1957 spray recommendations for tree fruits in eastern Washington.—*Ext. Bull. St. Coll. Wash.* 419 (revised), 37 pp., 10 figs., 1957.

This bulletin has undergone further revision [cf. 35, p. 896]. There are no major alterations concerning plant diseases.

Kessler (B.). **Effect of certain nucleic acid components upon the status of iron, deoxyribonucleic acid, and lime-induced chlorosis in fruit trees.**—*Nature, Lond.*, 179, 4568, pp. 1015–1016, 1 graph, 1957.

At the Agricultural Research Station, Rehovot, Israel, the spraying of chlorotic vine, peach, and plum branches with 50 p.p.m. solutions of adenine and guanine increased the soluble iron fraction and the chlorophyll content of the leaves, while the total iron remained constant. It is concluded that in lime-induced chlorosis the physiological availability of iron is reduced by a disturbance of the deoxyribonucleic acid metabolism.

Ibrahimov (G. R.) & Ahmedzade (A. Z.). Изучение болезней некоторых сортов плодовых культур в Нуха-Закатальской зоне Азербайджана. [A study of diseases of some varieties of fruit crops in the Nuha-Zakatal'sk zone of Azerbaijan.]—Науч. Зап. Азерб. Унив. [*Nauch. Zap. Azerb. Univ.*] 1, pp. 81–87, 1956. [Abs. in *Referat. Zh. Biol.* 6, p. 206, 1957.]

A disease survey of the Zakatal'sk region of the Azerbaijan S.S.R. showed that in addition to apples and pears black rot [? *Diplodia mutila*: cf. 36, p. 474] attacks apricots, maples [*Acer* spp.], oaks, roses, and walnuts.

Miller (P. M.) & Waggoner (P. E.). **Dispersal of ascospores of Venturia inaequalis.**—Abs. on *Phytopathology*, 47, 4, p. 245, 1957.

Continuous records [at Connecticut Agricultural Experiment Station] of numbers of air-borne ascospores of *Venturia inaequalis* showed that there were 18 separate discharges between 1st April and 4th June, 1956. The first, on 26th April, when leaves were in the 'delayed-dormant' stage, began one hour after rain started, increasing in the next four to five hours to maximum intensities, reaching 21,000 spores per cu. m. of air. There was practically no discharge during a long rainy period over 2nd and 3rd June, when perithecia were 25 to 35 per cent. full of spores. At this stage the asci have apparently lost their power to eject the ascospores.

Moore (M. H.). **Concentrate spraying of Apple trees. I. Fungicidal efficiency of lime-sulphur.**—*Ann. appl. Biol.*, 45, 1, pp. 11–18, 1 pl., 1957.

Most of these results of experiments conducted from 1947 to 1950 at East Malling Research Station, Kent, on the application by air-blast of undiluted lime-sulphur for the control of *Venturia inaequalis* and *Podosphaera leucotricha* on apple have already been noticed [33, p. 238].

Hamer (P. S.) & Hunnam (D.). **More results of trials with captan.**—*Grower*, 47, 12, pp. 746–747, 1957.

Following field applications of captan (50 per cent., 2 lb. in 100 gals.) three times at intervals of three weeks from the end of July [35, p. 902] at Kirdford [Kent] in 1956, the incidence of *Gloeosporium* spp. on stored apples was again reduced to a half to one-third of that on untreated fruit. Two applications, in August and September, gave equally good control, but the September one alone was ineffective.

Groves (A. B.). **Apple powdery mildew control studies.**—Abs. in *Phytopathology*, 47, 4, p. 245, 1957.

Using counts of the number of infections on terminal leaves recorded in reverse sequence of age to check the results of experiments on the control of *Podosphaera leucotricha* on apple [in the United States: cf. 35, p. 900], the author found that karathane (only slightly less effective at $\frac{1}{2}$ lb. than at 1 or $1\frac{1}{2}$ lb. per 100 gals.) gave 95 per cent. control; the combination of sulphur early and karathane late in the season combined with standard organic fungicides was equally effective. Anisomycin gave good control, but was markedly phytotoxic at 200 p.p.m.; griseofulvin was ineffective.

Barr (Helen E.), Clark (P. J.), & Jacks (H.). **Determination of tetramethyl thiuram disulphide and dimethyldithiocarbamate spray residues on Apples.**—*N.Z. J. Sci. Tech.*, Sect. B, 38, 5, pp. 425–432, 1957.

From 1953 to 1955, inclusive, in experimental orchards in different parts of New Zealand [35, p. 691] thiram, ferbam, and ziram spray residues on apples that had received different numbers of sprays at different strengths were determined by a micro method, which can detect 0·1 p.p.m. of fungicide. It is based on acid decomposition, steam distillation of dimethylamine with excess alkali, and the formation of cupric dimethyldithiocarbamate, which was determined colorimetrically. The amounts found did not exceed the tolerance limits allowed in the United States [36, p. 257]. Residues were greatest on fruit treated with summer oil sprays between the thiram or ferbam applications.

Mosse (B[arbara]). **Growth and chemical composition of mycorrhizal and non-mycorrhizal Apples.**—*Nature, Lond.*, 179, 4566, pp. 922–924, 2 figs., 1957.

In studies at East Malling Research Station on the effect of endotrophic mycorrhizal infection on plant growth [36, p. 903] apple seedlings or leaf-bud cuttings rooted in vermiculite, which were initially infection-free, were used as test plants, and *Endogone* sp. sporocarps as inoculum. Pots containing autoclaved loam and sand mixture, stored for six weeks before planting, were inoculated with 20 to 30 unsterilized sporocarps. All treated plants became mycorrhizal, while all but one of the controls were unaffected.

Results of five experiments conducted over a three-year period showed the mycorrhizal seedlings to be bigger, more sturdy, darker green and to have a higher content of potassium, iron, and copper, but strikingly lower magnesium.

Fischer (R.). **Die viröse Triebsucht der Apfelbäume.** [Proliferation virosis of Apple trees.]—*Pflanzenarzt*, 10, 1, pp. 1–2, 4 figs., 1957.

Witches' broom virus disease of apple trees [cf. 35, p. 775] has been present in Austria for many years. The Boskoop [cf. 33, p. 33], Berlepsch, and Golden Pearmain varieties seem particularly susceptible.

Gualaccini (F.). **Una virosi del Pero.** [A virosis of Pear.]—*Boll. Staz. Pat. veg., Roma*, Ser. 3, 14 (*1956*), 1, pp. 121–128, 7 figs., 1957. [English summary.]

In May, 1955, some branches of Nobile pear trees near Rome developed greenish-

yellow or pale yellow leaf spots bordered by the midrib and lateral veins and extending to the margin or producing a network effect. As applications of various elements and micro-elements had no effect, in August, 1955, reciprocal grafts were made to healthy pear trees of the Passa Crassana variety, failures being replaced by fresh grafts in February, 1956. By the summer, the scions on the diseased trees and the shoots produced by infected grafts on healthy trees both developed characteristic symptoms. The hypothesis that the disease is of virus origin is to be investigated further.

Gigante (R.). **Un grave deperimento del Pesco dovuto a clorosi ferrica ed all'azione del freddo.** [A serious decline of Peach due to iron chlorosis and the action of cold.]—*Boll. Staz. Pat. veg., Roma,* Ser. 3, 14 (*1956*), 1, pp. 89–101, 9 figs., 1957. [English summary.]

In June, 1955, Hale peach trees in an orchard near Ravenna, Italy, were affected by a serious decline. Most of those grafted on wild peach were markedly chlorotic (though not two ungrafted stocks), the leaves sometimes being malformed. The current year's growth was stunted and withered, with copious production of gum, older branches too being affected and cracking. The roots were sound.

Application of ferrous sulphate solution (1 gm. of solid per tree) through an incision in the bark resulted two months later in the production of new leaves of a normal green colour.

No causal organism appeared to be associated with the withering of the branches, which was attributed to cold weather in late spring, a view confirmed by microscopic examination of the affected parts.

Spraying programmes for control of fungus diseases of coastal Peaches.—*Agric. Gaz. N.S.W.*, 67, 12, pp. 649–650, 1956.

Composite spraying programmes [34, p. 794] for the control of leaf curl (*Taphrina deformans*), brown rot (*Sclerotinia fructicola*), freckle (*Fusicladium carpophilum*), and rust (*Puccinia pruni-spinosae*) on early, mid-season, and late-maturing peach varieties in coastal New South Wales are given in detail [cf. 35, p. 687 *et passim*].

Wishart (R. L.). **Apricot gummosis.**—*J. Dep. Agric. S. Aust.*, 60, 8, pp. 359–360, 1957.

In a general note on the control of apricot gummosis [associated with *Eutypa* sp.: 35, p. 376] the author reports that over the last three seasons the disease has caused the loss of 15 per cent. of the trees in Barossa orchards, only five per cent. of which were replaced by new plantings. In the absence of closer attention to control measures he predicts further decline in the non-irrigated districts of South Australia.

Crosse (J. E.). **Bacterial canker of stone-fruits. III. Inoculum concentration and time of inoculation in relation to leaf-scar infection of Cherry.**—*Ann. appl. Biol.*, 45, 1, pp. 19–35, 8 graphs, 1957.

In further work at East Malling Research Station on bacterial canker of cherry (*Pseudomonas mors-prunorum*) [35, p. 779; 36, p. 535], leaf scars on the fruiting spurs of trees of the highly resistant Roundel variety and the less resistant Napoleon were inoculated at four different dates during autumn, each time with the same range of five different concentrations of inoculum. The percentage of diseased spurs and the severity of symptoms in the following year both increased with the higher levels of inoculum. The median threshold concentration, i.e., that required to give 50 per cent. diseased spurs, varied with the date of inoculation, but was always much higher for Roundel than for Napoleon. Leaf scars at the nodes of the current year's growth were susceptible from the beginning of September to the

latter part of October, variation in incidence with the date of inoculation during this period being related, apparently, to the rate of evaporation of the infection drop and the rate of suction of the bacteria into the vessels of the leaf traces.

It is concluded that scars exposed during general leaf fall in early November are unlikely to become infected, most natural infections probably occurring earlier in the autumn, some, perhaps, even in September. Sprays at present recommended during the second week of October might profitably be given earlier, while those applied after the recommended period are of little value. Since the period of natural leaf-scar infection is an undoubtedly long one, and because it is impossible to cover leaf scars with spray residues as long as the leaf is attached, the present concept of 'protective' sprays may have to be replaced by one based on the eradication of external sources of inoculum.

Varuipaeva (Mme A. G.). Меры борьбы с серой плодовой гнилью Вишни. [Measures for the control of grey fruit mould of Cherry.]—Труд. Гроденск. сельскохоз. Инст. [*Trud. Grodensk. selokohoz. Inst.*] 2, pp. 176–186, 1956. [Abs. in *Referat. Zh. Biol.* 6, p. 206, 1957.]

For the control of grey mould [*Botrytis cinerea*] of cherries in the U.S.S.R., apart from strict sanitary measures, one application of a 9 per cent. solution of carbolineum is recommended. In one experiment it reduced inflorescence and branch infection five to ten times and increased yields two to two and a half times. One application of 1 per cent. Bordeaux mixture at the pink stage was as effective as three applications later (presumably during bud swell, after flowering, and 15 days later).

Fulton (R. W.). **Comparative host ranges of certain mechanically transmitted viruses of Prunus.**—*Phytopathology*, 47, 4, pp. 215–220, 2 figs., 1957.

At the University of Wisconsin, Madison, host range tests were made with four viruses mechanically transmissible from sour cherry, designated A, from a tree with necrotic ring spot [peach ringspot virus] and yellows [(sour) cherry yellows virus], B and E, from trees with cherry yellows virus, and G, from a symptomless tree known to carry ringspot virus. The 227 test species of 18 families were grown in pots in the greenhouse. All four viruses produced similar symptoms on cucumber [35, p. 688], but numerous differences became apparent on other hosts. The symptom types of those which reacted positively are tabulated. Virus A infected 51 species out of 186, B 86 out of 227, E 38 out of 145, and G 48 out of 150.

Viruses A, E, and G caused necrotic lesions on *Cyamopsis tetragonoloba* [*C. psoraloides*] and *Momordica balsamina*, making these suitable for infectivity assays. Virus B caused countable lesions on *Sesbania* sp., *Crotalaria spectabilis*, and *C. capensis*. On these findings the four viruses appeared to be distinct, B infected many species not reacting to the others, and A, E, and G differed sufficiently to be distinguished as strains, if not as separate viruses.

Gilmer (R. M.). **The behaviour of some stone fruit virus isolates in Cucumber and a new differential cucurbit host for a stone fruit virus.**—*Plant Dis. Reptr*, 41, 1, pp. 11–16, 5 figs., 1957.

At New York State Agricultural Experiment Station, Geneva, the development of type A or type B syndromes [34, p. 304] in cucumber seedlings inoculated with 44 virus isolates from stone fruits and one stone fruit virus from rose could not be correlated with virus content as indicated by the symptoms on four determinative *Prunus* hosts (Montmorency sour cherry, Albion plum, Shiro plum and Shirofugen cherry). The causal viruses could not be separated by any of a number of methods employed.

A virus latent in Montmorency sour cherry obtained from three sources and

producing both A and B type symptoms was rapidly detected by inoculation of Cocozelle squash seedlings [36, p. 332], which developed vein-clearing and prominent vein-banding within 18 days. In cucumber seedlings it produced symptoms indistinguishable from those of other stone fruit viruses. Though not conclusively identified, the virus may be [plum] line pattern virus [35, p. 286].

Rojecka (Mme M. N.). **Zgorzel Morw.** [Scorch of Mulberries.]—*Roczn. Nauk rol.*, A 72, 1, pp. 141–144, 1955. [Abs. in *Referat. Zh. Biol.* 6, p. 207, 1957.]

The symptoms produced on mulberry by *Pseudomonas mori* [cf. 31, p. 357], *Gibberella baccata* var. *moricola* [cf. 35, p. 468], and *Septogloeum mori* [31, p. 357] are described and control measures indicated.

Smith (W. H.). **Accumulation of ethyl alcohol and acetaldehyde in Blackcurrants kept in high concentrations of carbon dioxide.**—*Nature, Lond.*, 179, 4565, pp. 876–877, 2 graphs, 1957.

At the Ditton Laboratory, Larkfield, Maidstone, freshly picked black currants kept at 4·4° C. in a continuous flow at 30 l. per hour of various carbon dioxide-oxygen-nitrogen mixtures were uninjured after four weeks. [Unspecified] fungal rotting was completely suppressed in the mixtures containing 50 per cent. carbon dioxide and almost negligible in those with 25 per cent., but extensive in air after the first week.

Hall (C. B.) & Dennison (R. A.). **Lime-induced manganese deficiency of Strawberries.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 228–229, 1957.

An investigation conducted at the Florida Agricultural Experiment Station, Gainesville, of a leaf chlorosis of strawberry plants growing in two fields in the Starke area in 1955–6 showed that in both soils it was associated with a soil pH of 6·6 or more and a manganese content of 16 p.p.m. or less (on a dry weight basis). Slight manganese deficiency may be expected if the pH level is from 6 to 6·5.

De Fluiter (H. J.). **Aardbeiknotshaarluis en virusverspreiding.** [The Strawberry club-hair aphid and virus dissemination.]—Abs. in *Tijdschr. PlZiekt.*, 63, 1, p. 26, 1957.

In a large-scale field experiment at Bennekom, the Netherlands, in 1955 to determine the relation of *Pentatrichopus fragaefolii* to the spread of strawberry viroses [35, p. 377] the indicator plant *Fragaria vesca* was interspersed among the Madame Moutot crop in groups of 30 at successive 14-day intervals. The aphids were most mobile and virus infection heaviest between 29th July and 13th August. At this time all the indicator plants were infested with an average of 34 aphids per plant, and 87 per cent. were virus-diseased. During the next fortnight the percentage of aphids fell to 96, virus infection being 63 per cent. After 26th August the aphid population declined still farther (average of 2·1 per plant) and virus infection was practically absent. In the Madame Moutot crop the periods of heavy aphid infestation and severe virus infection coincided exactly with those of the indicator plants. During the autumn of 1955 and the spring of 1956 yellow edge developed extensively in Madame Moutot.

Although there were still many aphids (average of 1·25 per young leaf) in December, 1955, they were killed by a hard frost in February and no further influx took place until 12th September. Between 23rd May and December, 1956, not a single indicator plant among the 1,000 distributed over the field in groups of 75 at consecutive fortnightly intervals contracted virus infection, notwithstanding the abundance of yellow edge in the crop, a convincing proof of the hypothesis that the spread of strawberry viroses is negligible in the absence of *P. fragaefolii*.

Cercospora leaf spot of Bananas.—*Agric. Gaz. N.S.W.*, 67, 12, pp. 645–646, 2 figs., 1956.

Heavy losses were caused in New South Wales in 1956 by banana leaf spot (*Cercospora musae*) [*Mycosphaerella musicola*: 34, p. 284], incidence being greatly increased by the wet summer. Young banana leaves are particularly susceptible during the periods of high temperature and humidity occurring on the north coast between December and March, and bunch losses are greatest from January to May.

Spraying from December to March with a suspension of copper oxychloride (1½ lb. to 40 gals.), or Bordeaux mixture (1–1–10), and colloidal sulphur (1 lb. or 11·4 fl. oz. to 40 gals.) is recommended.

Hammarlund (L.). **Afprøvning af plantebeskyttelsesmidler 1955, 1956.** [Evaluation of plant protectives 1955, 1956.]—*Tidsskr. Planteavl*, 59, 5, pp. 852–866, 1956; 60, 5, pp. 852–870, 2 figs., 1957. [English summaries.]

These reports contain the following among other items of information from the Danish State Experimental and Research Station for Plant Diseases and Pests [cf. 35, p. 204]. Although thiram preparations, alone or combined with lindane, were more effective as seed dressings for beet than mercurials when judged by comparative germination levels, they were inferior in small-scale tests as aids to high production, especially thiram-lindane on clay soil.

In 1955 four applications of copper oxychloride for the control of potato blight (*Phytophthora infestans*) instead of the customary two resulted in an increased yield of some 1,000 kg. per ha. On the basis of the 1956 trials the use of maneb or a combination of ob 21 (copper) and zineb is recommended. The promising results obtained with dichlone require further confirmation.

In 1955 no difference was observed between 10 mercurials in respect either of efficiency in apple scab (*Venturia inaequalis*) control or toxicity to Cox's Orange Pippin. Mesulphan [36, pp. 377, 474] also proved satisfactory. All the thiram compounds already approved and a few new ones were tested in 1956, and here again no significant differences were detected either in efficacy or phytotoxicity. Effective new remedies for scab include two dichlone preparations [cf. 35, pp. 23, 195], the German tusan (containing arsenic), and a ziram emulsion. On account of their tendency to damage the leaves and fruit the dichlones should be used on a limited scale only until further information becomes available.

Wettable sulphur and thiram-sulphur gave better control of apple mildew (*Podosphaera leucotricha*) than karathane and captan in 1956, but the differences were not significant. In 1955, however, captan was quite useless in the treatment of the disease, lime-sulphur alone conferring a measure of protection.

Karathane (0·075 per cent.), applied four times beginning on 15th April and ending on 21st July, was the most efficacious of five chemicals tested against *Sphaerotheca mors-uvae* on gooseberries [cf. 35, p. 780] in 1955.

Captan and various mercurials gave good control of *Fusarium* on rye seed in 1955. In tests with 11 mercurials against wheat bunt [*Tilletia caries*] a reduction in the normal rate of 1 per cent. to 0·5 or 0·25 resulted in an appreciably higher incidence of infection and lower germination.

Hafiz (A.). **Aerial spraying and dusting and its scope in Pakistan.**—*Agric. Pakist.*, 7, 3, pp. 197–210, 1956.

This general note treats the aerial application of insecticides and fungicides under the headings: selection of chemicals; time of aerial operations; temperature suitable for air operations; drifting of the chemical; distribution of the chemical; pattern; aeroplane delivery rate; preliminary arrangements needed for carrying out aerial applications; requirement and output of aircraft; precautions; and scope of aerial applications in Pakistan.

The approximate operating cost of spraying by an S. 55 helicopter, assuming an establishment of three helicopters with three pilots, five mechanics, and 1,100 flying hours per machine per year, is estimated at 0·67 rupees (10/8 annas) per acre. For aeroplanes, with their lower initial costs and lower fuel consumption, the cost would be between 6 and 8 annas per acre, which is far cheaper than operation by ground equipment (3/12 rupees).

Schütz (K.). **Die Entwicklung der Sprühgeräte von 1939 bis 1955.** [The development of spray equipment from 1939 to 1955.]—*Dtsch. Agrartech.*, 6, 10, pp. 453–455, 6 figs., 3 diags., 1956.

This is an interesting survey of outstanding landmarks in the development of mist-blowing applicators for the control of plant pathogens, with special reference to *Phytophthora* [*infestans*] in the Swiss potato crop [cf. 32, p. 541 *et passim*]. Both the theoretical principles and practical procedure are considered, the uses of different types of machinery are explained, and current trends in the approach to field operations are briefly discussed.

Moore (M. H.). **Concentrate spraying.**—*Agriculture, Lond.* (formerly *J. Minist. Agric.*), 63, 12, pp. 579–582, 2 figs., 1957.

The advantages, difficulties, and present status of concentrate spraying, which term in England is generally confined to very low volume spraying at very high concentration, are discussed in relation to low-volume spraying as a whole [see above, p. 596].

Saving of costs is the chief advantage, while the main drawback is the tendency for the small mist-blown droplets to drift farther than the larger ones of a hydraulic spray. This makes the design of plot layouts for spray trials difficult, and in practice empirical trials on areas of about an acre are best.

Control depends, given satisfactory coverage, on the quantity of undiluted concentrate per acre irrespective of volume. For the control of apple scab (*Venturia inaequalis*), for instance, 3 gals. of lime-sulphur per acre is suitable for small trees when applied in compressed air with droplets 30 to 40 μ in diameter; increasing dilution with water up to 24 gals. per acre made no difference to the control. From results with lime-sulphur it is also concluded that risk of spray damage depends on the concentration of the material in proportion to its volume, high concentrations proving safe provided the droplets remain discrete.

Droplet size is most important at the lowest volumes, the volume of a droplet increasing eightfold as its diameter is doubled. Therefore effective machines for concentrate spraying as distinct from low-volume must produce a very fine mist. With large-scale machines the minimum limit for droplet diameter is 40 to 50 μ, which might need to be increased considerably in warm climates to avoid evaporation before impact. Phytotoxicity is reduced in direct proportion to the drying speed of the droplets.

The best guide to the effectiveness of a spray is dosage per acre, provided that coverage is adequate, and the concentration needed can be calculated from that known to be effective at high volume.

Martinez (A. P.). **Fungicides and plant injury.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 413–415, 3 figs., 1957.

From toxicity tests of six common fungicides on ornamental foliage plants at the Plant Pathology Laboratory of the State Plant Board of Florida it was concluded that nabam, maneb, and zineb should not be used against fungal infections of *Pilea cadieri*. If a fungicide has to be used on this host, copper A (4 lb. in 100 gals.) is recommended. *Philodendron* spp., *Scindapsus aureus*, *Dieffenbachia amoena*, and *Syngonium* sp. were not injured by any of the chemicals tested. *Gardenia jasmini-*

odes was burned by manzate (4lb. in 100 gals.). *Schlefflera* sp. developed fine chlorotic spotting after these three fungicides. P.C.N.B. (75 W at 100 lb. per acre), captan 50 W (4 lb. in 100 gals.) and copper A were non-injurious to all the eight plants tested. The paper concludes with some general directions for the application of fungicides to avoid toxic effects.

Brook (M.). **Tetrachloronitrobenzene as a fungicide.**—Abs. in *Trans. Brit. mycol. Soc.*, 40, 1, pp. 164–165, 1957.

Dusts containing tecnazene [34, p. 470 and next abstract], which is more effective than the 2345-isomer, can be used to control *Botrytis* disease [*B. cinerea*] of lettuce [32, p. 534]. It should be applied as a 5 per cent. dust from a smoke generator. In 1952–3 and 1953–4 [? at Nottingham University] it gave significant yield increases when 25 to 30 per cent. of the untreated plants were lost; check in growth was not excessive provided the rate of application did not exceed ¼ oz. per sq. yd.

When used to control dry rot disease of potatoes (*Fusarium caeruleum*) [35, p. 122], tecnazene may retard sprouting; the 2345-isomer was more effective as a fungicide and less phytotoxic in trials from 1952 to 1955, 5 per cent. dust at 5 lb. per ton as the tubers were lifted giving maximum protection.

Dransfield (M.). **The effects of tetrachloronitrobenzene on the soil microflora.**—Abs. in *Trans. Brit. mycol. Soc.*, 40, 1, p. 165, 1957.

Five per cent. tetrachloronitrobenzene [tecnazene], used [? at Nottingham University] at ½ oz. per sq. yd. against *Botrytis cinerea* on lettuce [35, p. 505 and preceding abstract], had no effect on the microflora of the soil. At ten times this rate the number of species isolated on Warcup plates was reduced, 2356-tecnazene being more inhibitory than the 2345-isomer, though neither affected species of *Pythium* or *Mortierella*. The number of bacteria was markedly increased. The fungicide decreased the resistance of lettuce to damping-off by *Pythium*.

Sowell (G.). **The assay of streptomycin as it relates to the control of bacterial spot.**—*Proc. Fla hort. Soc.*, 69 (*1956*), pp. 244–247, 1 fig., 1957.

In preliminary work at the Gulf Coast Experiment Station, Bradenton, Florida, on the bioassay of streptomycin in plant tissue, conducted with a view to ultimate improvement in the technique of control of bacterial spot (*Xanthomonas vesicatoria*) of tomato and [chilli] pepper by the use of this antibiotic [35, p. 413], Jefferson tomato plants 4- to 8-in. tall were sprayed twice with agristrep (at 496 p.p.m. streptomycin base), agrimycin (525 p.p.m.), or streptomycin STS Merck (500 p.p.m.), alone or with 1 per cent. glycerol, at an interval of three days. Leaves from each treatment series were removed for bioassay of the sap, the remaining plants being inoculated with a suspension of *X. vesicatoria*. Ten days after removal from the moist chamber the number of spots per plant was counted and more leaf samples taken.

In another experiment [chilli] pepper plants were sprayed weekly with agristrep 500 p.p.m. At each application date two more plants were added. One of the two plants in each group was washed; all the plants were then inoculated with *X. vesicatoria* and incubated. The bioassay procedure was a modification of the method of Mitchell *et al.* [33, p. 574].

The results showed that the streptomycin content of the sprayed tomato plants ranged from 37 to 110 p.p.m. Removal of the surface streptomycin had no effect on the severity of infection, which ranged from 0 to 2·5 spots on washed plants, and from 0·5 to 1·7 on unwashed plants, compared with 27·2 and 50·5, respectively, for those without streptomycin. The results with chilli were similar, though the numbers of spots were very much higher, but indicated that surface streptomycin may be more important in protecting chilli than tomato. Further studies are in progress.

Grainger (J.). **The economic effects of crop disease.**—*Res. Bull. W. Scot. Coll. Agric.* 16, 80 pp., 1 fig., 1 diag., 27 graphs, 1 map, 1956.

This informative bulletin deals with 12 years' investigations, mostly in experimental plots at Auchincruive, on crop losses from disease [cf. 36, p. 44] in western Scotland, their estimation, and economics. The author points out that where above-ground damage to plants is caused by disease the crop can often compensate for the loss by more efficient performance of the healthy remaining parts, so that percentage loss is less than percentage damage, though this compensation does not hold for loss of roots. For instance, thinning of the seedling stand of barley, oats, or [broad] beans by disease (even to 39 per cent. for barley) will still leave an optimum stand and further loss will be compensated for by better yield from individual plants.

Testing the effect on yield of damage by mechanical defoliation showed that oats are most susceptible to such injury when it begins in mid May and it can also cause noticeable loss if occurring shortly before harvest. Barley proved better able to stand defoliation than oats. The season of defoliation makes no difference to broad beans, but potatoes proved more susceptible to leaf damage than either of the cereals. Loss of roots appears to be more serious than the loss of any other part of the plant. Club root [*Plasmodiophora brassicae*] exerts its effect directly by destruction of roots, usually without compensation.

With diseases 'acting at a distance' (e.g., root damage resulting in reduced grain yield) or becoming systemic, as with viruses, loss of crop is directly proportional to the percentage of plants affected. Yield loss of individual diseased plants compared with healthy ones (87 per cent. for black currant reversion virus, 33 per cent. for tobacco mosaic virus on tomatoes) provides a factor which when multiplied by the percentage of diseased plants gives the total percentage loss.

Attention is drawn to the relation between the time when a disease appears, ensuing weather conditions [cf. 34, p. 692], and host physiology in their effect on the extent of the loss [cf. 36, p. 263]. With most crops disease attacks were lighter if planting was at the normal time than if done later. One exception was that chocolate spot (*Botrytis* sp.) was lighter on the late broad bean crop. On strawberry *B.* [*cinerea*] was always very much more severe on the first formed fruits, irrespective of other factors, and diminished on the later formed. It was found that this decrease was correlated directly with the modified C_p/R_s ratio [loc. cit.] (ratio of total carbohydrate of the fruit and residual dry weight). Discussing the control of potato blight (*Phytophthora infestans*) along the same lines [loc. cit.] the writer shows that in most parts of Scotland spraying (both protective and destructive) is uneconomic for other than late planted crops.

In reference to the effect of disease on the composition of useful produce it is noted that there is more protein and less carbohydrate present when oat leaves are covered by mildew (*Erysiphe graminis*), but the unpalatability of mildewed leaves to animals renders this conversion of no practical value. With many diseases that render produce unfit for humans the actual change in its chemical composition is shown to be comparatively small.

Disease blemishes on market produce often cause a reduction in value out of proportion to their actual extent or effect on yield. Fifteen per cent. scab (*Venturia inaequalis*) on apples may cause 50 per cent. lowering in price but with potato scabs [*Actinomyces scabies* and *Spongospora subterranea*] market loss will depend on the buyer's demand. A slight attack of black mould (*Cladosporium herbarum*) on cereals, with negligible loss of yield, results in classification of the grain as fit for fodder only, with a resultant loss of 10 to 17 per cent. in price.

Instances are given illustrating the results of persistent soil infection and the need for the replacement of perennially diseased crops, such as trees. When a soil-borne disease is introduced into clean land, the actual crop loss suffered must be

multiplied by the number of times this crop could have been grown again during the period necessary for the land to be kept free from it to eliminate the parasite. Concentration of a crop in any area favours disease spread, but in some degree may be unavoidable.

Various methods are described for estimating disease losses and making the necessary corrections for several of the factors involved [35, p. 208]. Discussing the economics of disease control, the author stresses the value of clean seed in avoiding otherwise wide fluctuations in yield due to virus. Disease control must relate to the market, and must not give rise to gluts. With glasshouse crops, more attention to control at seasons when prices are high is economically sound, even if disease is mild. The factors involved in potato spraying are illustrated by cases observed, such features as the relatively decreasing area of foliage protected by successive sprays, the increase of blight infection on the tubers by extending the period of green foliage, and the actual mechanical damage caused by control operations all requiring consideration.

In western Scotland annual losses from plant diseases (including eel worm) are rated at some £2,500,000 or 11 per cent. of the total crop production. Of this amount, 43 per cent. (about £1,100,000 worth) is controllable by known methods and 17 per cent. is actually controlled. In the last 12 years some £420,000 worth of loss formerly unrecognized or considered as uncontrollable has become amenable to control.

Details are given in an appendix of the methods used in small plot trials to obtain the data on which the conclusions reached are based.

STAKMAN (E. C.). **Problems in preventing plant disease epidemics.**—*Amer. J. Bot.*, 44, 3, pp. 259–267, 1957.

After a short historical introduction to the subject the bulk of the paper is devoted to a detailed discussion of the rise of stem rust of wheat (*Puccinia graminis*) [cf. 35, p. 210], though brief reference is made to other diseases and their control.

WEINBERG (E. D.). **Double-gradient agar plates.**—*Science*, 125, 3240, p. 196, 1 diag., 1957.

In a technique devised at the Department of Bacteriology, Indiana University, Bloomington, a test substance (a metallic salt) is included in the lower layer and an antimicrobial compound in the upper layer of nutrient agar gradient plates [cf. 35, p. 913]. The concentrations of the test substance which inhibit, partially inhibit, or fail to inhibit the micro-organisms are determined by preliminary titrations with single-gradient plates, appropriate ones serving as controls in the actual tests. The most consistent results were given by an inoculum per plate of not more than 10^3 viable cells in 0·05 ml. of nutrient broth, the test organisms being spread evenly over the surface. An alternative method was to streak the cells at right-angles to the double gradient. The technique clearly indicated suppression or increase of the activity of an antimicrobial compound by certain substances.

RICHARDS (M.). **A census of mould spores in the air over Britain in 1952.**—*Trans. Brit. mycol. Soc.*, 39, 4, pp. 431–441, 1 graph, 1956.

Agar plates were exposed for 10 mins. daily on weekdays at 10.0 a.m. at nine places in various parts of Britain from April to October, 1952 [cf. 29, p. 40; 33, p. 167]. Some 70 genera of fungi were recorded; about 90 per cent. of the isolates comprised species of *Cladosporium*, *Pullularia*, *Epicoccum*, *Botrytis*, *Alternaria*, *Penicillium*, Sphaeropsidales, *Aspergillus*, and *Sporotrichum*. The first five were commoner in rural areas than in towns, and *Penicillium* and *Aspergillus* more abundant in towns. *Cladosporium*, overwhelmingly predominant, ranging from 35 per cent. of the isolates at Liverpool to 88 at Rothamsted, was at a maximum everywhere from June to September.

Cheremisinov (N. A.). Формирование микофлоры. [The development of a mycoflora.]—Бот. Журн. [*J. Bot. U.S.S.R.* = *Bot. Zh. S.S.S.R.*], 41, 9, pp. 1293–1308, 1956.

The development of an associated fungus flora on plants in general, on cultivated plants, and on kok-saghyz (*Taraxacum kok-saghyz*) in particular is discussed with frequent reference to the literature, Russian and foreign (52 titles).

The general pattern of development is traced, three phases being recognized. In the first there are no fungi apart from the few occurring accidentally, which usually die soon after finding themselves in a new environment. In the second there is a number of fungal species but they are still practically insignificant, though already starting to show parasitic activities. They gradually adapt themselves to the new, unfavourable surroundings and become more harmful. The third phase is characterized by a numerous fungal flora (more than 10 species per plant), infection is more intensive, and the damage caused greater.

The complexity of the mycoflora varies with the plants. On long cultivated crops, such as cereals, it is very complex.

In kok-saghyz it is still in its initial stage. So far 38 species of fungi, which are listed, have been recorded on kok-saghyz [cf. 34, p. 472 *et passim*]; they include *Pythium debaryanum*, *Helminthosporium kok-saghyz* (both attacking seeds and shoots), *Puccinia silvatica* (leaves, inflorescences), *P. variabilis*, *Phyllosticta kok-saghyz* (both on leaves), *Fusarium avenaceum*, *F. equiseti* (both on cuttings), *F. bulbigenum*, *F. oxysporum* (both on roots, cuttings, and seeds), and *F. culmorum* (seeds).

Poisson (J.) & Guilbot (M. A.). **Microflora des farines françaises.** [Microflora of French flours.]—*Meunerie franç.*, *1956*, [? 3], pp. 42–52, 1956. [Abs. in *Zbl. Bakt.*, Abt. 2, 110, 6–10, pp. 287–288, 1957.]

In 13 lots of French flour [cf. 36, p. 16] mould spores per gm. ranged from 3,000 to 21,000, consisting of 75 per cent. *Aspergillus* spp. (nearly half of which were identified as *A. candidus*, the remainder being *A. glaucus*, *A. flavus*, *A. ochraceus*, and *A. versicolor*) and 15 to 20 per cent. *Penicillium* spp. Also consistently represented were *Cladosporium*, *Hormodendrum*, and *Alternaria* spp., *Mucor racemosus*, and *M. italianus* [*Absidia italiana*]. Yeasts, including *Rhodotorula* spp., were also detected in all the lots, but their numbers never exceeded 300 per gm. The bacterial population ranged from 10,000 to 84,000 per gm.

The higher the relative humidity and temperature during storage, the more rapidly did the number of bacteria decline, while mould multiplication (at a given temperature) increased. At a given relative humidity this rise was a function of temperature only up to about 35° C. With favourable relative humidities *P.* spp. predominated at 4°, up to 35° *A. candidus* and other *A.* spp., and at higher temperatures the Mucorineae.

The development of micro-organisms in flours with a moisture content below 14·5 to 15 per cent. was found to be preventable by storage at temperatures not exceeding 45°.

Klens (P. F.) & Stewart (W. J.). **New developments in textile preservation.**—*Amer. Dyest. Reptr*, 46, 10, pp. 346–350, 3 figs., 1957.

The results of studies at the Microbiological Laboratory, Nuodex Products Company, Heyden Chemical Corporation, New York, on the fungicidal treatment of cellulose materials [36, p. 448] against microbial attack are discussed and tabulated. Soil burial tests with a new copper formate process gave excellent results over a period of 16 weeks, but comparable performances were obtained with copper naphthenate, solubilized copper 8-quinolinolate [36, p. 261], and a new solubilized copper complex known as copper cupferron (fungitrol 25). Both copper formate and

copper cupferron, especially the latter, showed significant colour advantages over conventional copper fungicides.

Rose (G. R. F.), Fraser (M. E.), & Bayley (C. H.). **Some aspects of the use of 2,2′-dihydroxy 5, 5′-dichlorodiphenyl methane as a textile fungicide.**—*Amer. Dyest. Reptr*, 46, 11, pp. 385–390, 1957.

Experiments carried out by the National Research Council of Canada at Ottawa and in Nigeria showed that 2,2′-dihydroxy-5,5′-dichlorodiphenyl methane [35, p. 203] is an effective fungicide for use with cotton, though its effectiveness is reduced by water leaching under neutral conditions. Cotton treated with this compound, when exposed to ultra-violet radiation in the absence of wetting, is liable to enhanced breakdown, which is believed to be due to hydrochloric acid produced by the actinic breakdown of the compound, but it is concluded that under most conditions of outdoor weathering the compound used at concentrations of 0·5 to 1 per cent. should give protection equal to that of other textile fungicides currently in use.

Bakshi (B. K.). **Occurrence of mycorrhiza on some Indian conifers.**—*Mycologia*, 49, 2, pp. 269–272, 5 figs., 1957.

From the Forest Research Institute, Dehra Dun, India, illustrated descriptions are given of mycorrhiza found in deodar, spruce (*Picea morinda*), and fir (*Abies pindrow*) in the temperate regions of the Western Himalayas, Chakrata division, Uttar Pradesh State, at 6,000 to 8,000 ft., and in chir (*Pinus roxburghii*) in plantations at about 2,000 ft. In all four species the mycorrhiza were generally ectotrophic, the short roots being completely enveloped by the fungus mantle.

Morrison (T. M.). **Mycorrhiza and phosphorus uptake.**—*Nature, Lond.*, 179, 4566, pp. 907–908, 2 graphs, 1957.

Further studies at the Soil Bureau, Wellington, New Zealand, on the uptake of phosphorus-32 by *Pinus radiata* [33, p. 747] showed that during a 21-day experiment the P^{32} uptake by shoots of non-mycorrhizal plants was markedly greater than by those of mycorrhizal plants for the first four days after treatment, but that during the remaining period the position was reversed. It appears that in mycorrhiza there is an initial rapid accumulation of phosphorus by the mantle followed by a slower but relatively constant transfer to the host tissues.

Harley (J. L.). **The ecology of tree mycorrhiza.**—Abs. in *Trans. Brit. mycol. Soc.*, 40, 1, pp. 167–168, 1957.

In a discussion of the ecology of tree mycorrhiza [cf. 35, p. 703; 36, p. 431] it is noted that intensity of infection depends inversely on nutrient availability, and directly on light intensity and photosynthesis. At present little is known about the activities of mycorrhizal fungi away from the root, and their lack of close specificity handicaps comparison of the absorbing efficiency of different fungi on one host. Since spores form effective propagules, soil treatment is probably more important than inoculation in overcoming lack of mycorrhiza.

High internal carbohydrate status and root secretions determine dominance of mycorrhizal fungi on host roots, but no morphogenic substance encouraging formation of pseudo-parenchymatous tissue by fungi is yet known. Auxins are concerned in the morphogenic effects of fungi on their hosts, prolonging the life and complexity of the short roots, but mycorrhiza are functional only for short periods (about eight months in beech) and are constantly replaced.

On podsols and brown-earth soils mycorrhiza are essential to seedlings for optimum growth. Tree seedlings, other than exotics, transplanted to forest sites suitable for tree growth are likely to become mycorrhizal. It is important to decide

whether the best root system for transplanting and transport is mycorrhizal or non-mycorrhizal.

FARKAS (G. L.) & KIRÁLY (Z.). Изучение энзимологии больного растения в связи с устойчивостью его к микроорганизмам. [A study of the enzymology of a diseased plant in relation to its resistance to micro-organisms.]—Изв. Акад. Наук СССР [*U.S.S.R. Acad. Sci. News* = *Bull. Acad. Sci. U.S.S.R.*], *1956*, 5, pp. 47–58, 1956.

The results of recent studies [34, p. 441] at the Research Institute for Agriculture of the Academy of Sciences, Martonvásár, Hungary, on plant resistance to micro-organisms in connexion with enzyme action and carbohydrate metabolism, particularly in relation to respiration, are discussed in the light of the recent literature (56 titles) on the subject. The authors' own studies were concerned with the mechanism of respiration of wheat shoots infected with rust [*Puccinia* sp.] and powdery mildew [*Erysiphe graminis*: cf. 36, p. 95]. By means of vacuum infiltration various respiratory inhibitors were introduced into the leaves. It was found that healthy and diseased plants reacted differently to these inhibitors. Inhibitors of glycolysis arrested the absorption of oxygen equally in healthy and diseased plants; inhibitors of dehydrogenase, however, and to a certain extent those of oxidase acted differently. For example, malachite green arrested the respiration of healthy plants much more than that of diseased. This result was supported by the experiments with malonic acid; the respiration of healthy plants was highly susceptible to malonate, whereas that of infected plants was not. Therefore, it appears that in healthy plants biological oxidation occurs for the greater part with the help of the Krebs cycle. Respiration in infected plants must follow a different pattern, since absorption of oxygen can be arrested only to an insignificant extent by malonate.

With dinitrophenol the respiration of healthy plants is greatly intensified; that of infected plants rapidly decreases. This suggests that in all probability infection causes intensified respiration through a mechanism analogous to the action of dinitrophenol.

It is concluded that respiration in diseased wheat plants is accomplished by the interaction of ascorbic acid oxidase; in healthy plants this enzyme plays a less important part. In the wheat varieties studied here peroxidase activity did not increase as a result of rust infection. Therefore, in the authors' opinion, it is too premature to ascribe to peroxidase the entire protective role, although theoretically it is possible.

The experiments have also shown that in diseased plants respiration can be increased by means of totally different mechanisms, and, therefore, it is very doubtful whether such different means could lead to the development of resistance factors. The respiration of the highly resistant *Triticum timopheevi* and *T. monococcum* was substantially more intensive than that of the mass-grown susceptible Hungarian wheats, F 481 and Bankut 1201.

Thus, previous findings that the interaction between host and parasite is basically correlated with enzyme action and resistance are confirmed.

FENCL (Z.), & LEOPOLD (J.). **Mechanism of inhibition by acetic acid of the germination of spores of Aspergillus niger.**—*Nature, Lond.*, 179, 4566, p. 922, 1957.

The authors, working at the Institute of Biology Prague, have shown that undissociated lower fatty acids in molasses inhibit germination of *Aspergillus niger* spores. As acetic acid inhibits spore swelling before germination it is concluded that water accumulation in spores is a non-mechanical process due to internal cellular reaction. Preliminary experiments indicate that inorganic phosphate must be present in the medium during swelling.

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